

Infectious diseases in Finland

2007

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INFECTIOUS DISEASES IN FINLAND 2007

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In addition to commentary, the report includes figures and tables that are not employed in our regular reporting. Distributions by gender, age and region are available on our website. The figures for some of the diseases in the National Infectious Diseases Register will still be updated after the figures have been published in print. Up-to-date figures are available at <http://www3.ktl.fi/>

Guidelines and recommendations on infectious diseases are available on our website at <http://www.ktl.fi/portal/suomi/julkaisut>.

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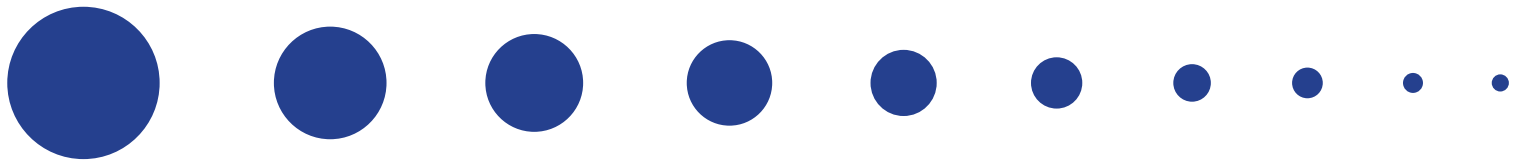
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CONTENTS

RESPIRATORY INFECTIONS.....	7
Influenza A.....	7
Influenza B.....	8
RSV (Respiratory syncytial virus).....	8
Legionella.....	9
Whooping cough.....	9
INTESTINAL INFECTIONS.....	11
Salmonella.....	11
Campylobacter.....	14
Yersinia.....	14
Shigella.....	15
Enterohaemorrhagic <i>Escherichia coli</i> EHEC.....	16
Norovirus.....	16
Rotavirus.....	17
Listeria.....	18
Food- and water-borne outbreaks.....	18
HEPATITIDES.....	21
Hepatitis A.....	21
Hepatitis B.....	21
Hepatitis C.....	22
SEXUALLY TRANSMITTED DISEASES.....	24
Chlamydia.....	24
Gonorrhoea.....	24
Syphilis.....	25
HIV.....	25
ANTIMICROBIAL RESISTANCE.....	27
MRSA.....	27
VRE.....	29
Pneumococcus.....	29
MYCOBACTERIAL INFECTIONS.....	31
Tuberculosis.....	31



OTHER INFECTIONS.....	33
Haemophilus influenzae	33
Meningococcus	33
MMR diseases	33
Puumala virus	33
Tick-borne encephalitis virus.....	35
Tularemia.....	35
Pogosta disease	35
Borrelia.....	35
Malaria	36
Blood and CSF findings in children.....	37
Blood and CSF findings in adults.....	39
AUTHORS.....	42



INTRODUCTION

Although the threat for an influenza pandemic did not appear much in media in 2007, work continued to convert the National Influenza Pandemic Plan into plans and practical measures in the regional level, primary health care, as well as in other sectors than health care. An EU-WHO evaluation of the preparedness in Finland in 2007 stressed the need to bring the planning and action to the primary health care level. The benefits of this preparedness, to a large extent generic for all unexpected biothreats, could be seen eg in how the regional and municipal level actors collaborated in a major water-borne outbreak of gastrointestinal disease in Nokia (see below).

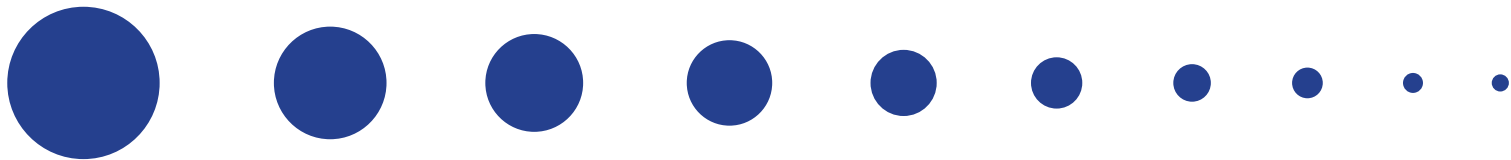
The structures for infectious disease surveillance, outbreak detection and investigations remained unchanged. To meet the information need in monitoring the effect of the revised (2005 and 2006) vaccination program, enhanced data collection by the National Infectious Disease Register was introduced for childhood whooping cough and tuberculosis, as well as all tick-borne encephalitis (TBE) cases.

The European Centre for Disease Control and Prevention (ECDC) in Stockholm continued the integration into its organisational structure of EU surveillance coordination, formerly based on devolved disease specific networks. Based on a thorough evaluation of each of the networks, some of them will still be coordinated from outside ECDC. From surveillance year 2007 onwards, virtually all surveillance data will be sent to a common data base in ECDC. Revised EU surveillance case definitions were published, which forms the basis on how surveillance data collection needs to be implemented in EU Member States. This led to a change in the criteria for registration for 2007 of tuberculosis cases for statistics in Finland.

GENERAL EPIDEMIOLOGICAL SITUATION IN 2007

Among respiratory infections, legionella cases increased clearly from preceding years. There were two international, travel-related incidents in which Finnish travellers were involved. A cluster of Pontiac fever, caused by legionella, in a plant reminded of the potential environmental risk spots in Finland. The increasing proportion of Legionellosis cases confirmed by urine antigen detection suggested that the use of this more sensitive diagnostic method, promoted for some years, is becoming more common and making the surveillance system more sensitive to detect outbreaks.

Gastrointestinal infections were dominated by norovirus early in the year and by the water-borne outbreak of gastrointestinal illness in Nokia in November-December. There was a major winter epidemic of norovirus in January to April, involving a large number of institutional outbreaks, and bringing the annual number of notified cases to the clearly highest level so far. Much of the increase in numbers is due to the fact the use of laboratory diagnostics for norovirus has most obviously increased considerably. The outbreak in Nokia, caused by massive accidental mix-



ing of partially treated sewage into the mains water for distribution, was the largest water-borne outbreak in Finland in recent decades, causing several thousand cases of gastrointestinal illness. The event has triggered a critical review of the risks in water systems all over Finland. The still ongoing investigations and analyses of collected data will give a comprehensive picture of the consequences of the event to health and economy.

Hepatitis A almost disappeared from the disease panorama in 2007, and acute hepatitis B cases fell to one tenth of the figures ten years earlier. Furthermore, the downward trend in newly diagnosed hepatitis C cases continued, particularly in teenagers and young adults. These support the perception that the control activities involving increased vaccination (A and B) of travellers and specific risk groups, together with comprehensive measures to reduce intravenous drug abuse and the infectious disease harms from it have been effective.

Although there was no clear increasing (nor decreasing) trend for sexually transmitted diseases in 2007, there were features of concern in their epidemiology. Regionally, in the Helsinki metropolitan area there was a major increase in syphilis cases transmitted through sex between men. HIV cases remained at the high level of the preceding record year, due to an increase in cases acquired both in heterosexual and in sex between men. Although travel-related transmission of syphilis and HIV remains important, the risk of contracting these infections in Finland is also real.

For tuberculosis, the favourable downward trend continued, although the total number of cases rose slightly due to purely technical reasons, ie revised criteria in registering cases in statistics. There was no increase in pediatric tuberculosis cases (with comparable registration criteria), which is reassuring after the change in BCG vaccination policy in 2006 from universal to risk-group vaccination.

Among the indicators for development of the antimicrobial resistance situation, there is cause for concern: the total number of MRSA, as well as the proportion of MRSA among invasive isolates of *Staphylococcus aureus* remain stable, and the proportion of *Streptococcus pneumoniae* with decreased susceptibility to penicillin remained at 14%, but the number of cases with VRE doubled from the preceding year. The combat against resistance needs to be strengthened to improve the situation.

Helsinki May 2, 2008

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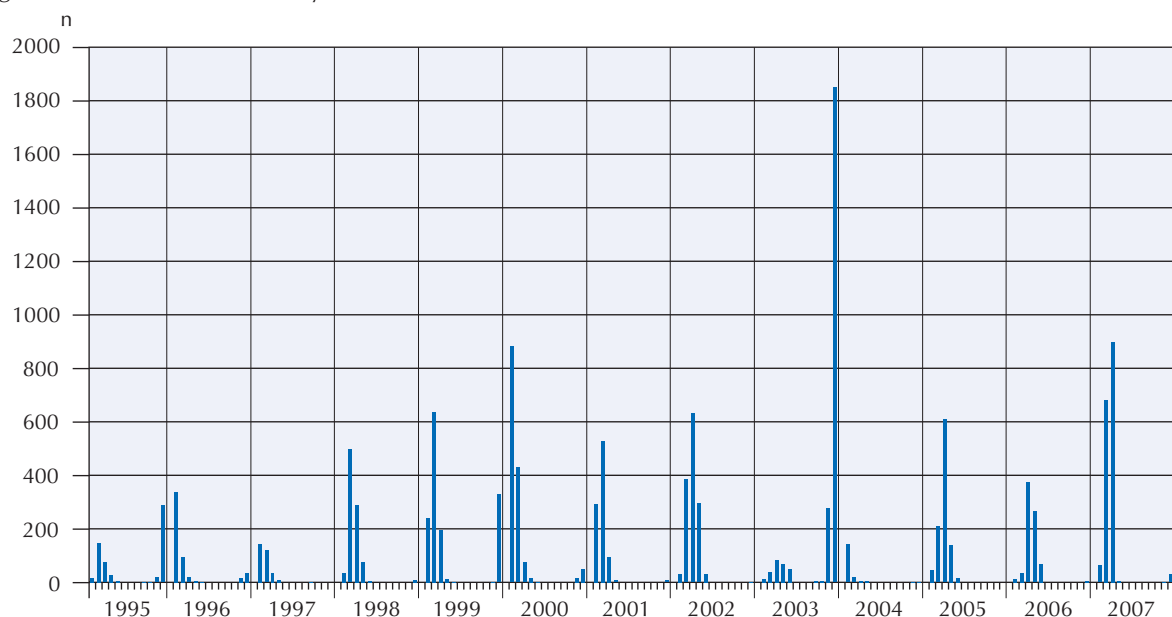
RESPIRATORY INFECTIONS

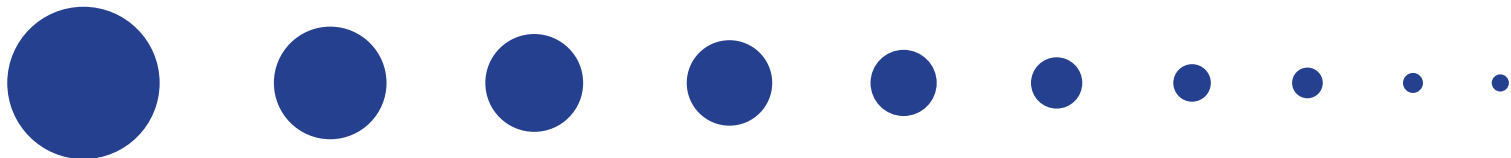
INFLUENZA A

The epidemic in winter 2006–2007 was caused by subtype H3N2 viruses, which have typically caused clinically severe infections in young children and in over 65-year-olds. The proportion of children was high in the influenza A findings notified to the National Infectious Diseases Register. Under 5-year-olds accounted for 24 per cent of the cases, while only seven per cent of the patients were over 64 years old. The 15–24-year-olds were a third important age group with 13 per cent of all the findings. Conscripts were overrepresented in this age group. The first cases of influenza were diagnosed as early as November–December, but the epidemic did not take off until January, peaking in February–March. The last, sporadic cases of influenza A were reported in May.

The H3N2 viruses of the season 2006–2007 had developed from the Fujian/411/02 virus or its close relatives. In the season 2003–2004, the appearance of Fujian viruses was a new feature in the antigenic variation of the H3 viruses, and they caused an early, intensive epidemic in that season. Antigenically, the viruses of winter 2006–2007 represent Wisconsin/67/05 type variants and belong to the same genetic lineage as the Wisconsin/67/05 H3N2 virus that was included in the vaccine in autumn 2006. At least with regard to this subtype, the vaccine was constructed correctly. The close relationship of the H3 viruses circulating in winter 2006–2007 to the epidemic viruses of the two previous winters explains at least partly the limited size of the epidemic, as the majority of the population had at least some protective immunity against these viruses.

Figure 1. Influenza A cases by month, 1995–2007





Only one case of influenza A subtype H1N1 virus, considered typical for children and young adults, was diagnosed at the National Public Health Institute. The virus was antigenically and genetically similar to the Solomon Islands/3/2006 virus that has been diagnosed elsewhere as well and was included in the vaccine in autumn 2007. The importance of this variant was not realised until after a decision was made in February 2006 to continue using the New Caledonia/20/99 virus in the vaccine to represent the H1N1 viruses. Fortunately, the H1N1 virus has not caused an extensive epidemic.

INFLUENZA B

The influenza B epidemic in winter 2006–2007 was very mild, and the majority of cases were diagnosed as late as March–April. The National Infectious Diseases Register received 107 notifications, representing all age groups. In long-term surveil-

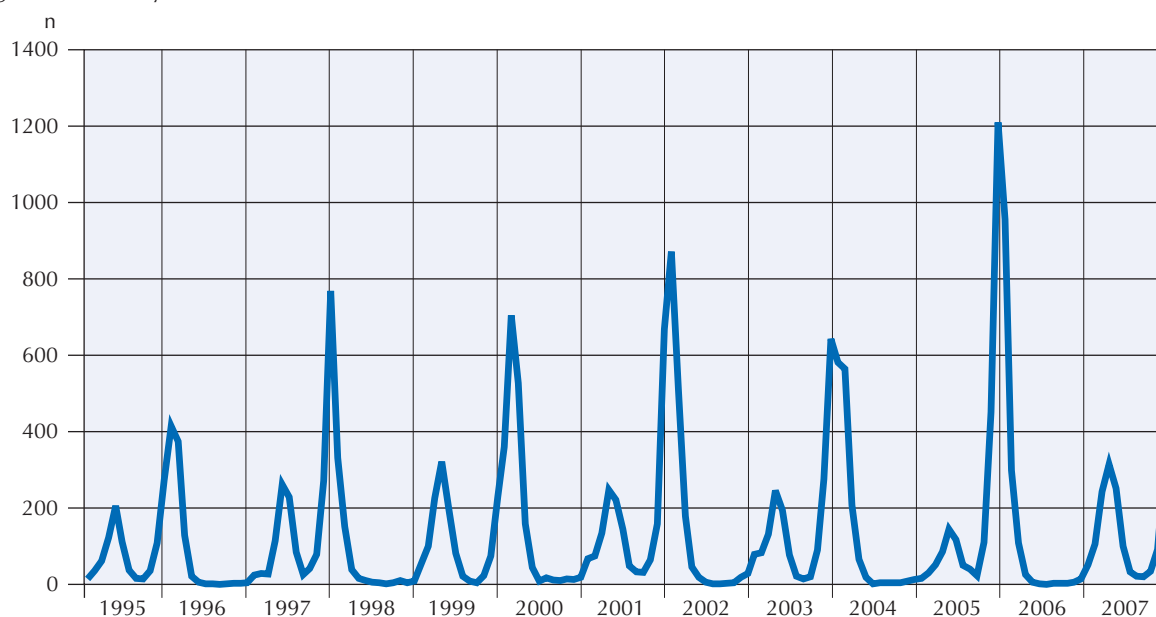
lance, B epidemics have broken out later than A epidemics and have been more limited in size. The slower variation rate of B viruses and the protective immunity that has developed in the population with time have probably slowed the spread of B epidemics more efficiently than A epidemics.

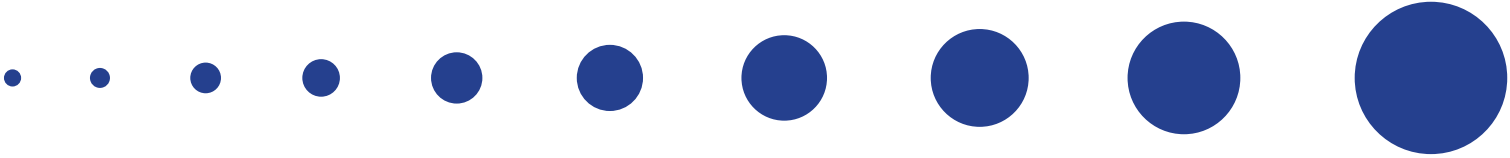
Today, the influenza B viruses circulating the world are divided into two lineages: Yamagata/16/88 and Victoria/2/87. The autumn 2006 vaccine included the Malaysia/2506/04 virus that represents the Victoria lineage. During the entire winter, the National Public Health Institute isolated an influenza B virus in two patients only. They both represented the Yamagata lineage, which means that with regard to influenza B viruses, the choice of vaccine virus was not optimal either.

RSV (RESPIRATORY SYNCYTIAL VIRUS)

In 2007, National Infectious Diseases Register received about 1,600 notifications of laboratory-con-

Figure 2. RSV by month, 1995–2007





firmed RSV cases (3/100,000), which was about the same as in 2004 and 2006. The latest peak was observed in 2005 with 2,330 cases. In Finland, RSV follows a regular two-year pattern: in uneven years there is a limited spring outbreak, followed by a more forceful winter outbreak around New Year. The 2007 spring outbreak was more intensive than usual, peaking in April. Incidences varied by hospital district (6–87/100,000). As in previous years, nine out of ten RSV cases were diagnosed in 0–4-year-olds. Even though infections occur in all age groups, babies and small children constitute the majority of cases leading to hospitalisation and laboratory diagnostics (Figure 2).

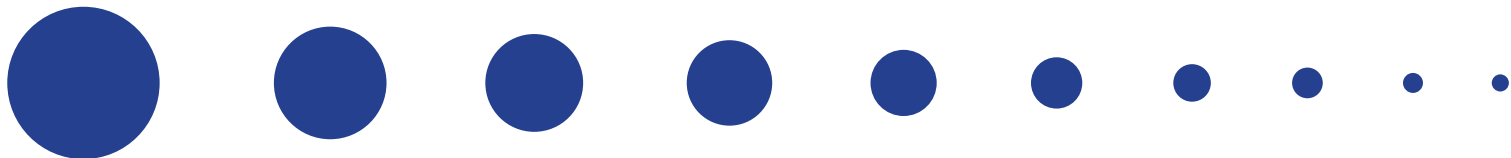
LEGIONELLA

In 2007, there were 46 notified cases of legionella based on laboratory findings, 30 men and 16 women. Their age ranged from 18 to 79 years. From 1995 to 2006, the National Infectious Diseases Register received about 10–30 notifications of legionella each year, which makes the 2007 figure exceptionally high. The rise may partly be explained by increasing awareness of legionella infections, resulting in more frequent testing for legionella. In eight cases, the diagnosis was based on sputum or BAL fluid culture or PCR, in eleven cases on detection of antigen in urine, and the rest were based on serological methods. In further investigations, the clinical picture was found to be consistent with legionellosis in 31 cases, in other words, the patient had symptom-based or radiologically diagnosed pneumonia. All the eleven patients whose legionella was confirmed by a urinary antigen test had pneumonia. In 2007, one 49-year-old male with a severe underlying disease died of legionellosis.

About half of the legionellosis patients had been abroad prior to becoming ill (and stayed at a hotel). The accommodation data of these patients were reported to EWGLINET (the European Surveillance Scheme for Travel Associated Legionnaires Disease), which collects data on travel-associated legionella findings. At New Year 2006–2007, three Finnish and five other Nordic tourists contracted legionellosis after staying at a hotel in Phuket, Thailand. In June 2007, two Finnish and three British tourists staying at a hotel in Sunny Beach, Bulgaria, caught legionellosis. It is also possible to become exposed to a legionella infection in Finland. Two men contracted a legionella infection on the same occasion from a Jacuzzi bath at a sauna; one of them was diagnosed with pneumonia. Late in 2007, three employees at a Finnish chemical plant were diagnosed with Pontiac fever, caused by the legionella bacterium.

WHOOPIING COUGH (BORDETELLA PERTUSSIS)

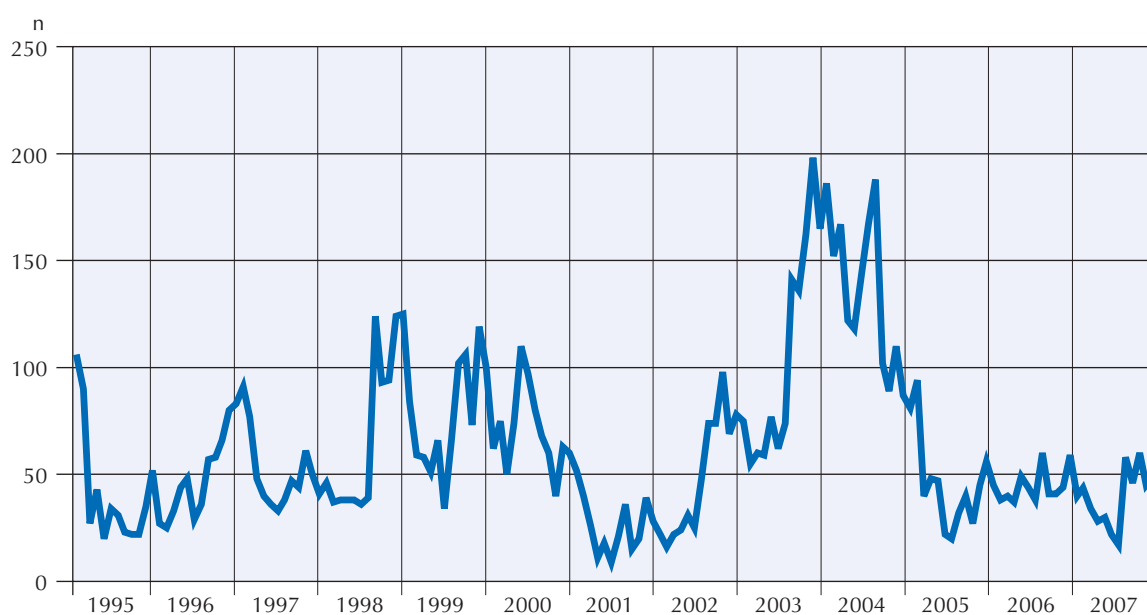
In 2007, the number of whooping cough cases notified to the National Infectious Diseases Register totalled 478 (9/100,000), which is slightly below the figure of the preceding year (536 cases). The majority of cases were diagnosed based on antibody testing. There were 29 findings (6%) in children under 12 months of age, and half of these in children under three months of age. As previously, schoolchildren were the largest patient group. About one third of the cases were reported in over 20-year-olds. There was less variation in prevalence between hospital districts than previously (3–17/100,000). The incidence was highest in the Lappi hospital district and lowest in the Kymenlaakso hospital district. It can be expected that



the booster vaccinations administered to 6-year-olds since 2003 and to 11-year-olds since 2005 will change the epidemiological situation of whooping

cough in the next few years. The figures for 2007 do not yet indicate any significant changes in the situation (Figure 3).

Figure 3. Whooping cough by month, 1995–2007



INTESTINAL INFECTIONS

SALMONELLA

There were 2,735 cases of salmonella notified in 2007 and 2,576 cases in the year before. In 2006 and 2007 there were more notified cases than in the preceding years. Fifty-four per cent of the patients were women. Annual incidence in the entire country was 52/100,000 population. The incidence rates were highest in the hospital districts of Etelä-Savo (89/100,000) and Kanta-Häme (69/100,000) and lowest in the hospital districts of Keski-Pohjanmaa (31/100,000) and Kymenlaakso (37/100,000). The incidence was highest in 20–54-year-olds (66–85/100,000) and lowest in over-75-year-olds (9/100,000).

The most common *Salmonella* serotypes were Enteritidis (796 cases), Typhimurium (396), Stanley (175) and Virchow (158). More than one

salmonella serotypes were diagnosed in 31 cases.

There were 11 diagnosed cases of *S. Typhi*, which causes typhoid, six cases of *S. Paratyphi A*, which causes paratyphoid, and three cases of *S. Paratyphi B*. Travel data were available for all the *S. Typhi* cases; only one of them had not travelled abroad. All the patients with *S. Paratyphi* had been abroad. *S. Typhi* and *S. Paratyphi* were most often contracted in India or Thailand.

There were 380 (14%) salmonella cases acquired in Finland and 2,270 (83%) acquired abroad. No country of acquisition was specified in 85 cases (3%). The total number of domestically acquired infections was similar to the figure in 2006 (432 cases), with an incidence of 6/100,000 inhabitants. *S. Typhimurium* serotype caused the majority of domestic cases (156 cases, 41%), fol-

Figure 4. Salmonella and Campylobacter cases by month, 1995–2007

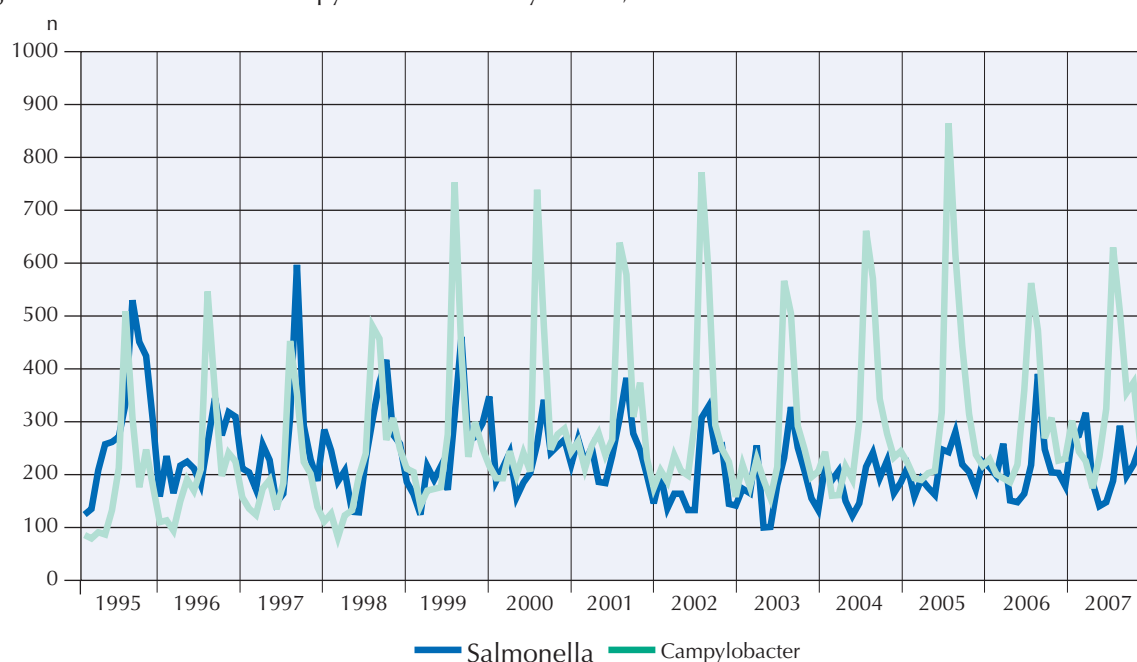


Table 1. The most common serotypes of salmonella cases, 1997–2007
(*S. Typhi* and *S. Paratyphi* not included)

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Infections acquired abroad											
<i>Salmonella</i> Enteritidis	912	944	892	1046	1238	904	907	774	834	879	735
<i>Salmonella</i> Typhimurium	159	133	103	204	139	115	135	166	194	141	246
<i>Salmonella</i> Virchow	85	82	76	49	79	55	67	74	88	80	135
<i>Salmonella</i> Hadar	57	79	112	125	96	69	58				
<i>Salmonella</i> Newport	34							53		66	
<i>Salmonella</i> Infantis		67									
<i>Salmonella</i> Braenderup			38	49							
<i>Salmonella</i> Stanley					62	65	67	105	113	116	175
<i>Salmonella</i> Corvallis									60		59
Other	758	827	680	747	757	636	628	665	654	745	920
Total	2005	2132	1901	2220	2371	1844	1862	1837	1943	2027	2270
Domestically acquired infections											
<i>Salmonella</i> Typhimurium	499	222	375	124	152	222	137	131	240	170	150
<i>Salmonella</i> Enteritidis	79	59	83	52	63	42	61	81	75	69	61
<i>Salmonella</i> Hvittingfoss						26					
<i>Salmonella</i> Hadar	31		10	17							
<i>Salmonella</i> Infantis	24	21			19				10		
<i>Salmonella</i> Newport	22	66					16	7		9	12
<i>Salmonella</i> Saintpaul		22									
<i>Salmonella</i> Agona			85	27	41	16	12	27	32		40
<i>Salmonella</i> Poona			10				9				
<i>Salmonella</i> Virchow				15						11	23
<i>Salmonella</i> Ohio					12						
<i>Salmonella</i> Abony						15					
<i>Salmonella</i> Stanley								8	5		
<i>Salmonella</i> Give										39	
Other	153	122	93	90	103	85	75	81	80	98	86
Total	808	512	656	325	390	406	310	335	442	396	372
Country of acquisition not specified											
Number of cases	233	301	476	223	145	102	107	86	111	153	93
Total	3046	2945	3033	2768	2906	2352	2279	2258	2496	2576	2735

lowed by *S. Enteritidis* with 62 diagnosed cases.

The total number of salmonella infections acquired abroad was 2,270 and the incidence was 39/100,000 population. The *S. Enteritidis* serotype caused 735 (32 %) of the cases with foreign origin.

The next most common serotypes acquired abroad were Typhimurium (246 cases), Stanley (175 cases), Virchow (135 cases) and Corvallis (59). The leading countries of acquisition were Thailand (36%), India (8%), Spain (5%) and Bulgaria (5%).



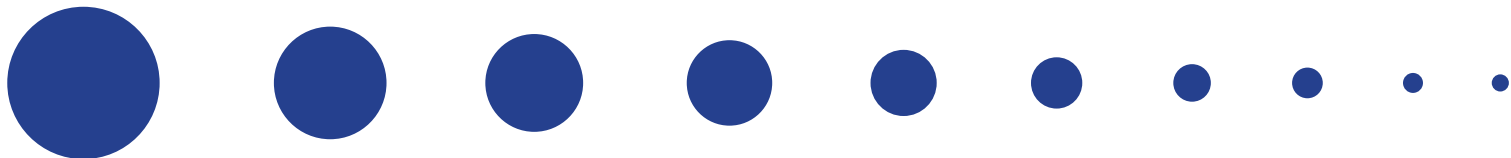
Epidemiology of salmonella phenotypes and genotypes

Fifty different serotypes caused domestic salmonella infections. The leading five serotypes were the following: Typhimurium (41%), Enteritidis (16%), Agona (11%), Newport (7%) and Stanley (3%). Phage type NST (not specific type) caused the majority (29%) of domestic Typhimurium cases (156 cases). Sixty-four per cent of these represented the genotype STYM 187 with a new DNA profile, associated with an outbreak of salmonellosis in the Mikkeli region caused by *S. Typhimurium*. The traditional endemic phage type FT1 caused 24% of the domestic Typhimurium cases. It was distributed to six different genotypes. As previously, the majority of cases (81%) represented the genotype STYM 1, which is susceptible to antimicrobials. More than 10% of all domestic Typhimurium cases were caused by Typhimurium FT 104, STYM 7, ACSSuT (resistant to ampicillin, chloramphenicol, streptomycin, sulphonamide, tetracycline). This is more than twice the figure in 2006, but the majority of cases were associated with one outbreak (a day-care centre in Helsinki). This type of *S. Typhimurium* is occasionally also isolated from Finnish livestock, but it is not known to have a permanent reservoir in Finland. The Enteritidis serotype is not known to have a permanent reservoir in Finland either. Nevertheless, 62 domestic cases were diagnosed. Forty-seven per cent of them represented the phage type FT 4 (main genotype SENT 2, reduced susceptibility to fluoroquinolones [$\text{MIC} \geq 0.125 \text{ mg/L}$]) and 27% represented the phage type FT 21 (SENT1, susceptible to antimicrobials).

The salmonella infections acquired abroad represented 144 different serotypes. The leading five serotypes were the following: Enteritidis (31%), Typhimurium (11%), Stanley (8%),

mainly from Thailand), Virchow (6%, Thailand, India, Gambia, Egypt) and Group B (4%, Thailand). The most common Enteritidis phage types were FT 1 (23%; 25 different countries, most of the DNA profiles represented the genotype SENT 1 or SENT 2), FT 21 (15%; the majority of cases acquired in the Mediterranean region; SENT 1, SENT 2), FT 4 (14%; Central and Southern Europe, Estonia; SENT 2, SENT 6), FT 8 (9%; Hungary, Bulgaria, Tunisia; SENT 15). The most common Typhimurium phage types were FT NST (36%; 21 different countries, 16 different genotypes), FT 120 (14%; mainly Thailand), FT 193 (9%; mainly Thailand).

According to “epidemiological” susceptibility testing involving twelve antimicrobials (salmonella strains isolated from 2,460 cases were analysed), 9% of Finnish and 15% of salmonellas acquired abroad were multiresistant (resistant to at least four antimicrobials). Nalidixic acid resistance (Nal R) can be used to predict reduced susceptibility ($\text{MIC} \geq 0.125 \text{ mg/L}$) to fluoroquinolones. Thirteen per cent of the domestic strains and twenty-two per cent of the strains acquired abroad were Nal R strains. More than 90% of these strains showed a reduced MIC value to ciprofloxacin, regardless of whether the strain was of domestic or foreign origin. Of all the strains, only five (0.2%) were resistant to cefotaxime; the infections were acquired in Thailand, South Africa, Ethiopia and Italy. In addition, eight strains had intermediate (I) susceptibility to cefotaxime. One of these infections was acquired in Egypt and the rest in Thailand. It can be expected that the proportion of cefotaxime-resistant strains will increase in future, if tourism to Thailand maintains its popularity among Finns.



CAMPYLOBACTER

In 2007, the National Infectious Diseases Register received 4,107 notifications of campylobacter infections. This is 19% (668 cases) higher than in 2006. *Campylobacter jejuni* was clearly the prevailing campylobacter species (3,237 cases). There were 197 notified cases of *C. coli* and 669 untyped campylobacter findings. The incidence rate in the entire population was 78/100,000. Fifty-two per cent of the patients were men. The incidence rate was highest in 25–34-year-olds (161/100,000). Helsinki and Uusimaa (122/100,000) and Pirkanmaa (105/100,000) were the hospital districts with the highest incidences. The lowest incidence was reported in the hospital district of Åland (11/100,000). The seasonal variation was typical for campylobacter. The incidence was highest in July–August. The number of cases reported in

December (480) was more than double compared with previous years. The high incidence in Pirkanmaa and the record number of cases in December are explained by a water-borne outbreak in Nokia in November–December. In December, Nokia reported 191 campylobacter cases, while there was only one reported case in December of the preceding year.

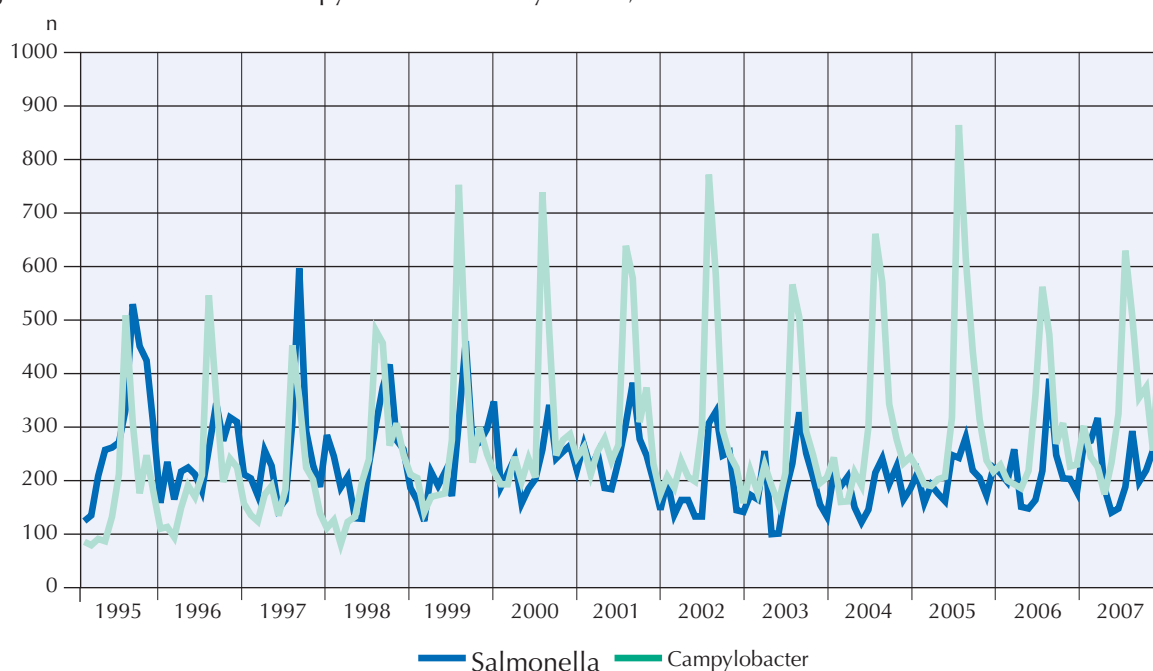
In 3,112 cases (76%) information was obtained about travelling abroad. Seventy-five per cent of these patients had been abroad just prior to becoming ill. The leading countries of acquisition were India (302 cases), Thailand (291 cases) and Spain (217) (Figure 4).

YERSINIA

Yersinia enterocolitica

The number of *Yersinia enterocolitica* cases has

Figure 4. Salmonella and Campylobacter cases by month, 1995–2007



gradually decreased since 1995 (873). After a few relatively stable years, the number of cases fell by 22% from 2006 (533) to 2007 (414). This figure is the lowest in the entire surveillance period. In 2007, the incidence rate in the entire country was below 8/100,000. The highest incidences were reported in over 75-year-olds (15/100,000). There is great regional variation in the number of *Yersinia enterocolitica* findings. The incidence was highest in the hospital district of Kainuu (26/100,000), while no cases were diagnosed in the hospital district of Etelä-Savo. (Figure 5).

Yersinia pseudotuberculosis

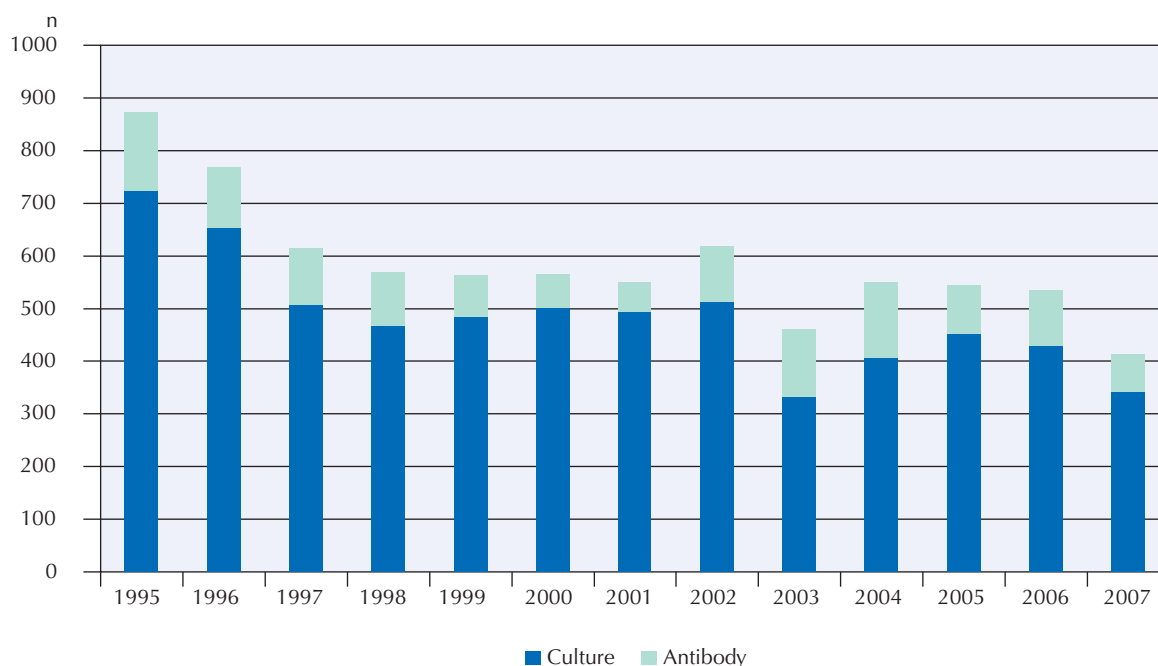
The number of *Yersinia pseudotuberculosis* cases dropped back to a low level (56 cases) after the high figure (252) in 2006. No distinct trend can be seen in the incidence of *Y. pseudotuberculosis* cases; in

many years, outbreaks have caused great variation in the number of cases. In 2007, the incidence in the entire country was 1/100,000 population. The number of cases is so low that regional differences cannot be described; nine hospital districts did not report any cases in 2007 (Figure 6).

SHIGELLA

The incidence of shigellosis in 2007 was 2.1/100,000. There were 112 notified cases, of which 37 were men and 75 women. The incidence was highest in 25–49-year-olds. Half of the cases (56) were diagnosed in the Helsinki and Uusimaa hospital district, which also had the highest incidence rate (4/100,000). There were no cases in seven hospital districts. Eighty infections were acquired abroad and twenty-five in Finland. In seven cases the country of acquisition was not specified. The prevailing shigella species were *Shig-*

Figure 5. *Yersinia enterocolitica* cases, 1995–2007



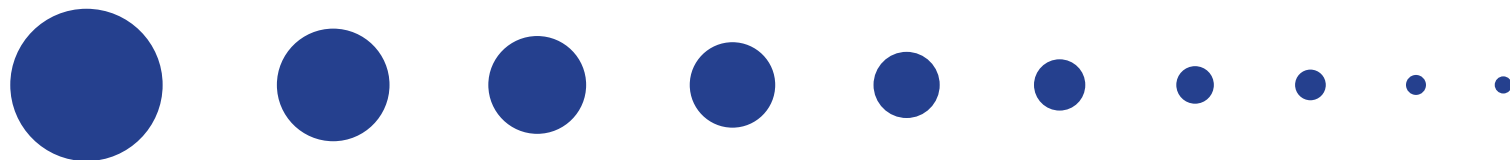
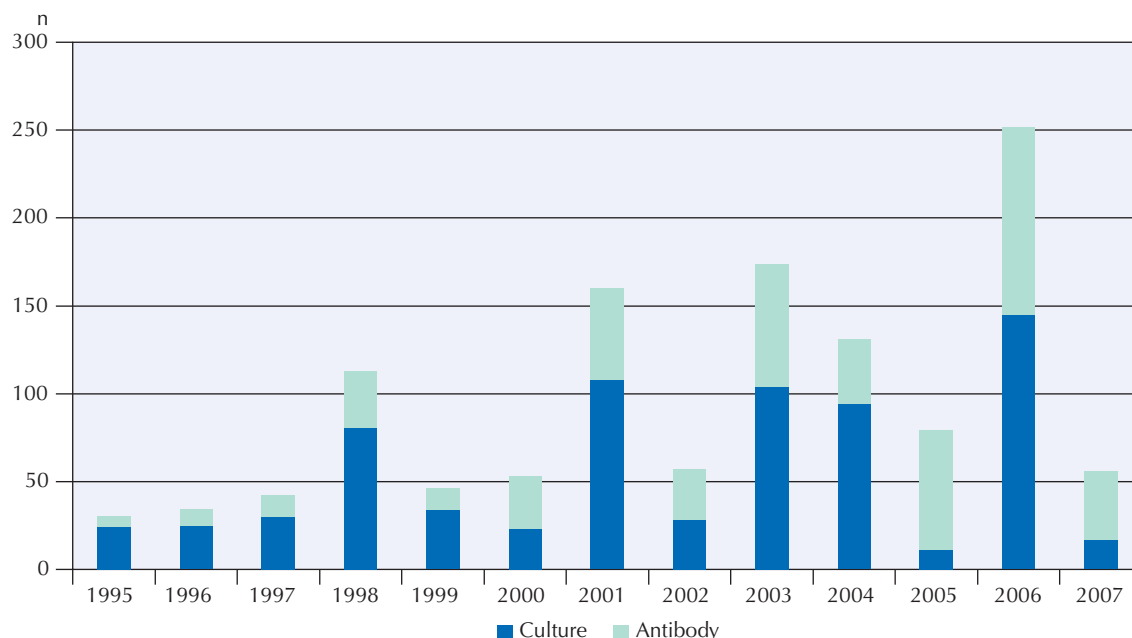


Figure 6. *Yersinia pseudotuberculosis* cases, 1995–2007



ella sonnei (58 cases), *S. flexneri* (26 cases) and *S. boydii* (19 cases). There were only two cases of *S. dysenteriae*. The leading countries of acquisition were India (27), Finland (25) and Egypt (11). The high number of domestic infections was due to *S. boydii* findings in Pirkanmaa in connection with two individual outbreaks (see the section on outbreaks).

Eighty-seven per cent of the shigella strains were resistant to at least four antimicrobials. Fifty-one per cent were resistant to nalidixic acid and about 89% of these exhibited impaired susceptibility to ciprofloxacin (MIC at least 0.125 mg/L). Nalidixic acid resistant strains came mainly from India. Among these, the strains with the highest resistance to ciprofloxacin (MIC 4–12 mg/L) represented *S. flexneri* serotype 2a or 3a. Also, the Finnish epidemic strain (*S. boydii* “temporary” serotype E140634) showed reduced susceptibility to ciprofloxacin.

ENTEROHAEMORRHAGIC *ESCHERICHIA COLI* EHEC

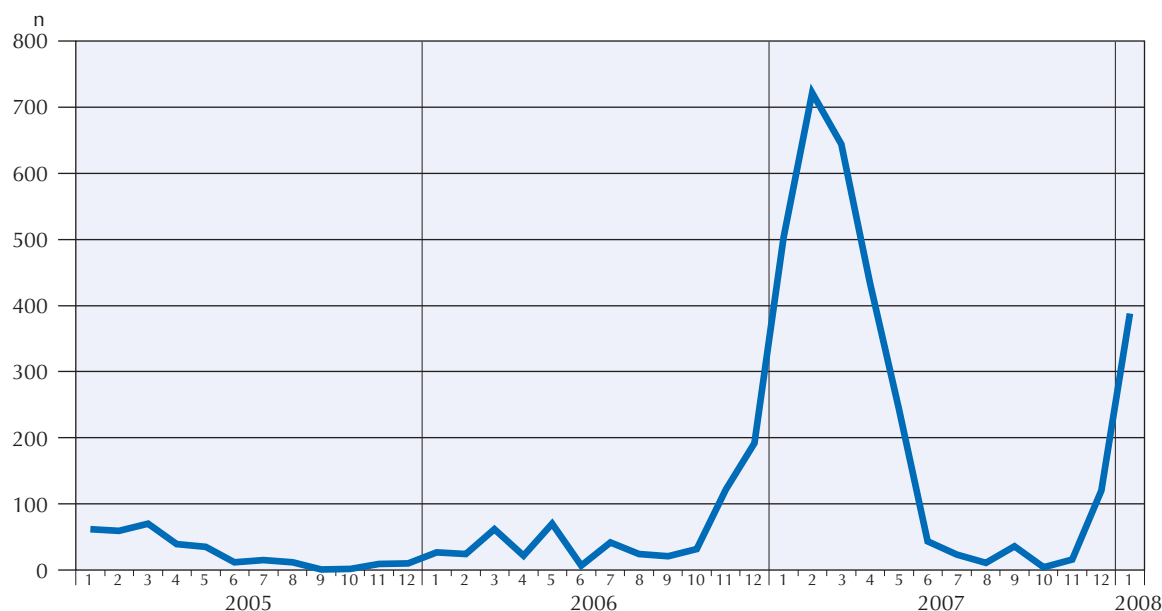
Twelve microbiologically confirmed cases of enterohaemorrhagic *Escherichia coli* (EHEC) were notified to the National Infectious Diseases Register (0.2/100,000). The number of cases has remained approximately the same in recent years. Seven cases were diagnosed in women and five in men. Six patients were under 15 years old, four of them 0–4 years of age. In one child the infection led to HUS syndrome. In seven cases the infection was acquired abroad.

O157 serogroup strains caused nine infections, three of them in one family. In addition, there were three individual non-O157 infections, one of them acquired abroad.

NOROVIRUS

In 2007 there were 2,790 notified cases of norovirus, 1,596 of them (59%) in women. The incidence rate, 53/100,000, was clearly higher than in the

Figure 7. Norovirus cases by month, 2005–2007



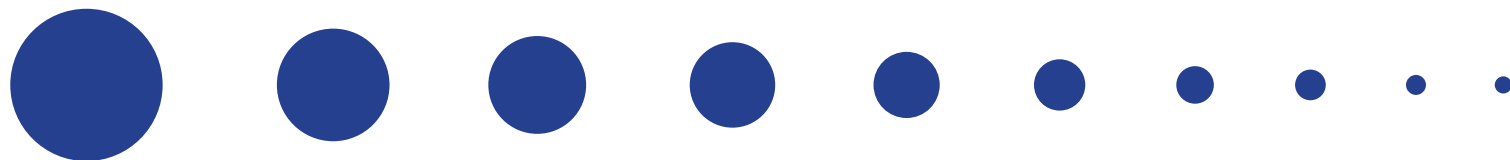
preceding years. More than 80% of the cases were notified in January–April. More than half (53%) of the patients were over 75 years of age with an incidence rate of 379/100,000, but infections were diagnosed in all age groups. The highest incidences were reported in the hospital districts of Lapland, Keski-Pohjanmaa and Helsinki and Uusimaa.

The accumulation of norovirus cases in the first part of the year was the result of numerous institutional outbreaks that began to occur at the end of 2006, particularly in hospitals and old people's homes. This also explains the high incidence rate in the elderly and the considerable regional variation. In the background of these outbreaks was the emergence of new genotype GII.4 norovirus variants (GII.4-2006a and GII.4-2006b). During the winter, the proportion of GII.4-2006a decreased and GII.4-2006b became dominant. In December 2007, there was another sharp upward turn in the number of cases. This was due to numerous insti-

tutional outbreaks caused by the GII.4-2006b variant. In addition to this dominant variant, infections caused by the GI.1, GII.7 and GI.3B variants were diagnosed during the autumn. The GI.1 variant, which does not normally cause hospital outbreaks, caused an outbreak in wedding guests in Northern Finland in September. In the latter part of the year, the outbreaks caused by the GII.7 variant included a long-lasting outbreak in a garrison in Central Finland.

ROTAVIRUS

In 2007 there were 973 notified rotavirus cases, with an incidence of 19/100,000. Of these, 522 cases were diagnosed in men and 451 in women. The number of cases was clearly the lowest in the 2000s so far. The monthly variation of incidence rates followed the normal pattern: the number of cases rose during spring, peaked in April and decreased in June–July. The incidence was clear-



ly highest in children under five years of age (312/100,000). They constituted 91 per cent of all cases. All hospital districts notified cases. The incidence rate was highest in the Lappi hospital district (84/100,000). In all the other hospital districts, the incidence rate remained below 36/100,000, in some hospital districts even considerably lower than this. These are interesting times with regard to the rotavirus, as the first rotavirus vaccine was licenced in Finland in the summer of 2006. At first the vaccine was used sporadically, but the use increased vigorously in 2007. Based on sales figures, nearly one out of three newborn babies received a rotavirus vaccination in 2007.

LISTERIA

Forty *Listeria monocytogenes* infections were notified in 2007. Fifty-three per cent of the patients were men and seventy per cent were 65 years of age or older. The annual incidence of listeriosis was 7.5 cases per million population. There were 36 blood findings (90%) and three CSF findings. One finding was obtained from other puncture samples. One patient died. None of the cases were associated with pregnancy, and only one of the patients was a child. Listeriosis was diagnosed in nearly all hospital districts, with the number of cases ranging from zero to seven. Serotype 1/2a caused 58 per cent of the infections, and serotype 4b caused 30 per cent.

SIGNIFICANT FOOD- AND WATER-BORNE OUTBREAKS

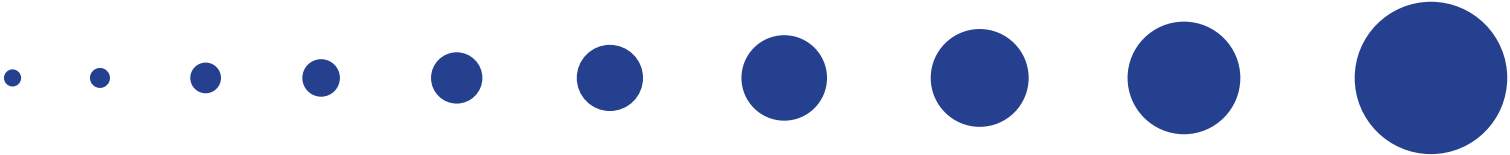
In 2007, the National Public Health Institute received 55 notifications of suspected food- or water-borne outbreaks. They included an extensive

water-borne outbreak in Nokia with several diagnosed pathogens, and an outbreak of gastrointestinal illness caused by *Shigella boydii* at the Tampere Hall. Several other gastrointestinal infection clusters were investigated as well.

Water-borne outbreak in Nokia

At the end of November (28–30 November, 2007), about 400,000 litres of treated waste water leaked into the clean water supply in the city of Nokia. The leakage was noticed on Friday, 30 November 2007, and the residents of Nokia were told to boil their drinking water. The contamination of the water resulted in an extensive outbreak of gastrointestinal illness. More than 1,000 persons sought care at the health centre or the hospital emergency department. The inpatient ward of Nokia Health Centre treated 51 patients and the Tampere University Hospital treated 185 patients, 126 of them children. The main pathogens were norovirus and *Campylobacter*, but *Salmonella*, *Giardia*, rotavirus, *Shigella boydii* and *Clostridium difficile* were detected in patients as well. Water samples also contained a wide range of microbes that mostly matched those found in the patients. The outbreak was exceptional in its extent, and the number of microbes found was unusual. Domestic water outbreaks usually involve only one pathogen, even though the samples collected from patients are always analysed for all of the most common bacteria causing gastrointestinal illness (campylobacters, salmonellas, yersinias, shigellas) and often also for the most common viruses (norovirus, rotavirus, adenovirus).

The National Public Health Institute, Pirkanmaa Hospital District, City of Nokia and University



of Tampere conducted a survey to analyse overall morbidity, complications, costs and psychological effects on the population. The questionnaire was sent to 3,000 persons in Nokia and in Kangasala, which was selected as a control municipality. Tampere University Hospital conducted additional surveys to investigate complications related to the outbreak.

***Shigella boydii* in Tampere**

The Tampere Hall hosted a Red Cross emergency care symposium from 19 to 20 November 2007. About 400 people from all around Finland attended the symposium, and some of them fell ill with gastrointestinal illness already in the afternoon of November 19. Eighteen culture-confirmed cases of *S. boydii* were diagnosed during the outbreak. A questionnaire survey was conducted. Of the 223 participants who completed the questionnaire, 90 had fallen ill with gastrointestinal illness between November 19 and 25. Based on the questionnaire survey, no food served at the symposium could be identified as a possible cause for the outbreak. No shigella was detected in the samples collected from the kitchen staff and waiters, and their interviews did not reveal any trips abroad with the possibility of contracting a shigella infection. The cause of this outbreak is rare in Finland, and the mechanism of infection remained unclear despite extensive investigations. The same uncommon *S. boydii* ("provisional serotype E140634") strain was later diagnosed in some patients during the water outbreak in Nokia. The strains were confirmed in the international reference laboratory of HPA (Health Protection Agency) in England.

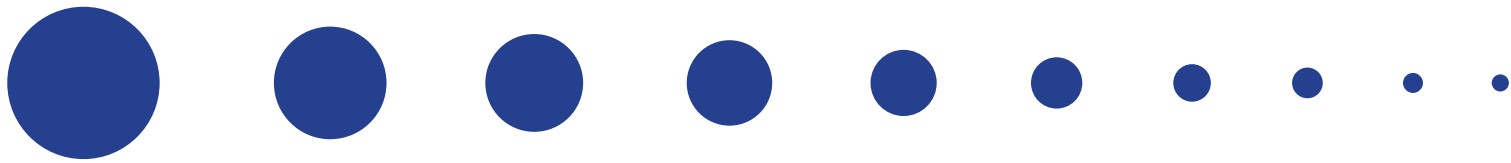
***Salmonella* Weltevreden**

Four *Salmonella* Weltevreden infections were diagnosed in Norway between 10 and 15 October 2007 in patients with no preceding history of travelling abroad. The outbreak resulted in an inquiry that covered all the EU countries. It revealed that infections caused by this salmonella serotype had been diagnosed in Finland and Denmark as well. A few days later in Denmark, *S. Weltevreden* was isolated from alfalfa seeds. MLVA and PFGE analyses showed it to be identical with the human findings (DNA profile SWEL 4). A total of 45 persons fell ill during the outbreak, 20 of them in Norway, 19 in Denmark and eight in Finland. Alfalfa shoots from the same producer, already withdrawn from the market, were analysed in Finland as well, and an identical *S. Weltevreden* was isolated. The shoots had come to Finland from a Dutch supplier and were probably of Italian origin.

***Salmonella* Newport (genotype SNWP 55)**

Salmonella Newport was the cause of gastrointestinal illness in 25 people in different parts of Finland in November–December 2007. Disease clusters occurred in Rauma, Lappeenranta, Tampere, the Oulu region and the Helsinki region. In Rauma and Lappeenranta, the common factor was mass catering: in Rauma it was the food supplied by the municipal central kitchen and in Lappeenranta the food supplied by a sheltered home. There were no children among the patients.

The *S. Newport* strains found in the patients had identical DNA profiles. This type had never before been found in humans or animals, neither in Finland nor abroad. The outbreak was microbiologically interesting, because some of the epidemic strains formed colony types that represent-



ed two antigenic structures (*S. Newport*'s normal O:6+ form and the O:6- form). Had this been an individual infection, the O:6 negative would have been specified as *S. Bardo*. The outbreak was investigated by interviewing patients, and tracing back and testing the food that had been served. However, the vehicle could not be identified.

***Salmonella Newport* (genotype SNWP 45)**

A cluster of five *Salmonella Newport* cases was detected in Helsinki in December. The interviewed patients had attended the same event at the beginning of December. The DNA profile of the epidemic strain was completely different from that of the *S. Newport* epidemic strain described above.

***Salmonella Typhimurium* FT 104**

In April, fifteen *S. Typhimurium* infections were detected at a day care centre in Helsinki. The phage type of the epidemic strain was FT 104, resistance profile ACSSuT (ampicillin, chloramphenicol, streptomycin, sulphonamide, tetracycline) and DNA profile STYM 7. The salmonella type in question is often found in persons who have been in Spain. One of the children had visited Spain.

***Salmonella Typhimurium* FT NST**

In July, eight *S. Typhimurium* infections were diagnosed in the Mikkeli region. The source of infection was not identified. Twenty persons altogether became ill with gastrointestinal illness in Mikkeli in August at a workplace party and in September at a funeral. *S. Typhimurium* was found in stool samples in all the patients. It was susceptible to anti-

microbials. Also, the phage type (NST, not specific type) and DNA profile (STYM 187) of the strains were identical with the July strain. The same catering service supplied food to both occasions, but the food that caused these infections could not be identified in the investigations. The catering service employee tested negative for salmonella.

***Salmonella Enteritidis* in a formula race**

A number of spectators became ill during the Formula 1 race in Hungary between 3 and 5 August 2007. *Salmonella Enteritidis* FT 8 was found in patient samples. There were several dozen patients, 22 of them Finns. The other nationalities included Hungarians, Swedes, Norwegians, Dutchmen and Austrians. Outbreak investigations revealed that most of the patients had eaten at the same buffet on 3–4 August 2007, and almost all of them had eaten chicken. The food served on these particular days was no longer available for analysis, but *Salmonella* Infantis grew in the broiler samples collected on 5 August. Stool samples from 21 symptom-free restaurant employees were analysed as well; *S. Enteritidis* FT 8 was found in 12 employees.

***Salmonella Agona* at two confirmation parties**

Twelve cases of *Salmonella Agona* were diagnosed in June. They were associated with a confirmation party held in Tampere. The epidemic strain was susceptible to antimicrobials, and its DNA profile was SAGO 39. A cluster of 15 cases caused by a similar strain was diagnosed in Loppi in July–August. The cases were again associated with a confirmation party.

HEPATITIDES

HEPATITIS A

In 2007, the National Infectious Diseases Register received 17 notifications of hepatitis A (incidence 0.3/100,000), which is the lowest figure ever. Twelve patients were men and five were women. Most cases (12) were diagnosed in the HUS district, while sixteen hospital districts had no diagnosed cases. The highest number of cases, eight, was diagnosed in the age group of 15–29-year-olds. Seven infections were acquired abroad and six in Finland. In four cases the country of acquisition was not specified. Two Finnish patients contracted the infection from a close relative who had taken ill after travelling abroad.

The incidence of hepatitis A has remained low after the epidemics among injecting drug users

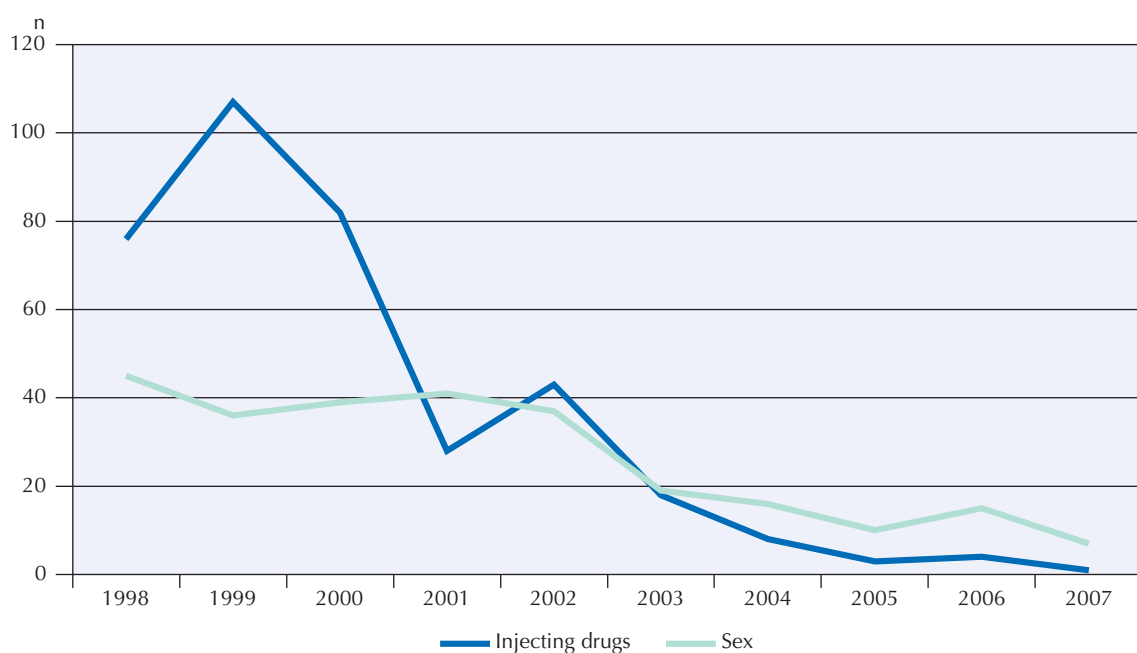
in 2002–2003 and is still falling, possibly because of vaccinations targeted at risk groups and travellers. The family of a hepatitis A patient must always be protected by gamma globulin or vaccination.

HEPATITIS B

In 2007, only 23 acute hepatitis B cases were notified to the National Infectious Diseases Register, which is less than a tenth of the top figure in 1997. In 2007 there were no signs of clusters that have been described in previous years.

Fourteen of the patients were men and nine were women. The majority of cases (12) were diagnosed in the Helsinki and Uusimaa hospital district. Twelve hospital districts had no diagnosed

Figure 8. Acute Hepatitis B cases, injecting drugs and sexually transmitted infections, 1998–2007



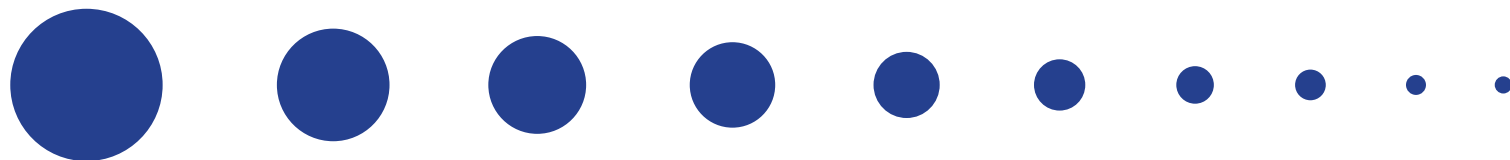


Table 2. Acute Hepatitis B cases by mode of transmission from physician notifications, 1998–2007*)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Injecting drugs	76	107	82	28	43	18	8	3	4	1
Sex	45	36	39	41	37	19	16	10	15	7
Perinatal	1	1	1	-	1	1	-	-	-	-
Blood products	4	1	1	1	1	-	3	-	-	-
Other	4	9	8	6	2	1	4	3	2	1
Unknown	116	103	109	51	93	67	28	18	16	14
Total	246	258	240	127	177	106	59	34	37	23

cases. The number of infections has continued to fall among young and middle-aged adults.

It seems that including hepatitis B vaccinations in the general vaccination programme for risk groups, as well as the health counselling for injecting drug users and the adverse effect prevention work have had the desired results (Figure 8, Table 2). Only one case of acute hepatitis B associated with injecting drug use was diagnosed in 2007.

HEPATITIS C

The number of hepatitis C cases continued to decrease in 2007, albeit slowly. Nevertheless, the decrease continues, and closer examination of the figures reveals some positive trends. It is difficult to separate acute hepatitis C infections from those

acquired years ago, which is why any changes in the figures should be interpreted cautiously. The prevalence of hepatitis C is so high among injecting drug users that changes in prevalence are very slow, even if the risks were well under control.

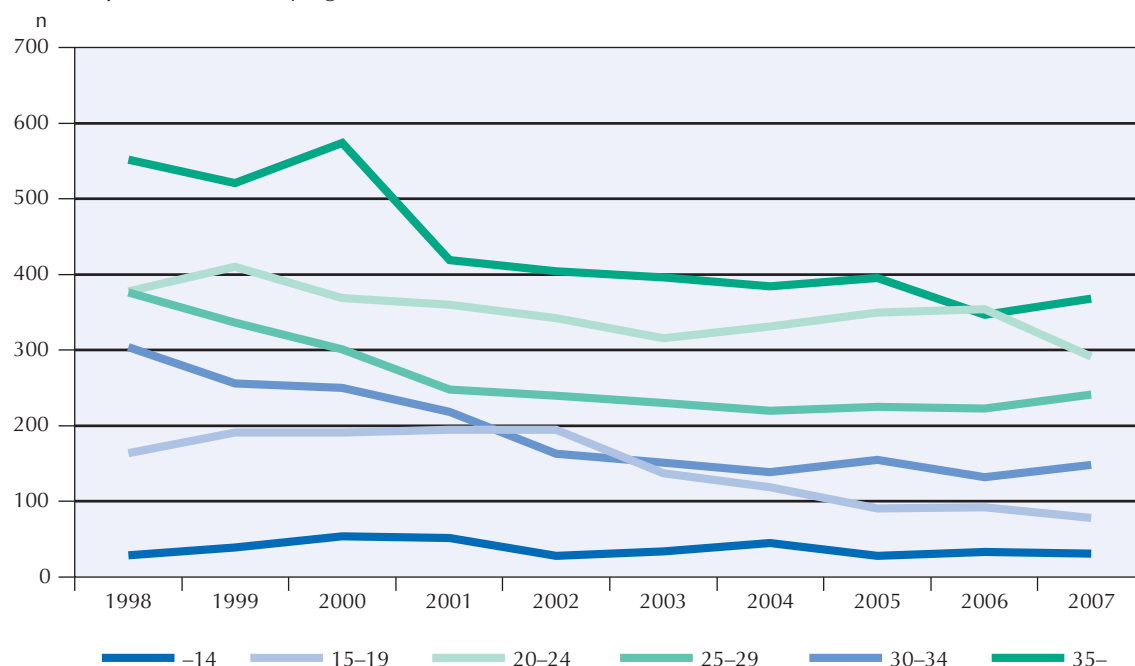
Most of the cases with an identified source of infection are associated with injecting drug use (Table 3). The number of these cases has been decreasing throughout the 2000s (928 cases in 2000, 571 cases in 2006; the decreasing trend seems to continue in 2007). At the same time, the number of cases with unknown origin has decreased less rapidly (708 cases in 2000, 486 in 2006). This suggests that the decrease is real and not, for example, a result of doctors reporting the source of infection less frequently than before.

Table 3. Hepatitis C cases by mode of transmission from physician notifications, 1998–2007*)

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Injecting drugs	1047	1001	928	822	710	627	603	621	571	416
Sex	55	35	41	42	45	46	59	61	70	63
Perinatal	4	10	6	3	3	1	10	5	8	4
Blood products	27	23	25	19	18	22	18	24	7	17
Other	24	40	31	31	28	34	31	35	37	23
Unknown	646	643	708	574	567	533	517	497	486	634
Total	1803	1753	1739	1492	1372	1264	1238	1244	1181	1157

*) Between 1995–2003 four HBV cases have been notified to have been transmitted by Finnish blood products. Since 2000 no cases of HCV transmitted by Finnish blood products have been notified. The surveillance for the mechanism of transmission for HCV was started in 1998.

Figure 9. Hepatitis C cases by age, 1998–2007

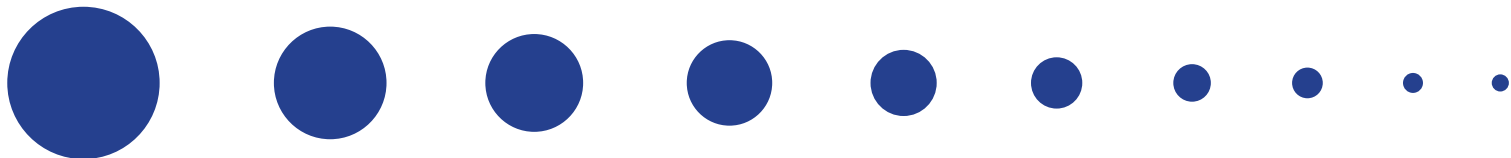


With regard to age groups, the number of HCV cases among 15–19-year-olds has fallen by more than half since 2002 (Figure 9). There are signs of a decrease among 20–24-year-olds as well. In older age groups the number of cases has fallen less drastically. This may suggest that the health counselling and adverse effects prevention work targeted at injecting drug users have been so successful in infection risk prevention that an HCV infection is acquired later in life than before, if the drug use continues for a long time. It seems that the health counselling provided for injecting drug users and the adverse effect

prevention work has had the best results in the youngest age groups, which was one of the main goals.

As regards the regions of Finland, the incidence rates of HCV have decreased in the provinces of Western, Eastern and Southern Finland. However, in the provinces of Oulu and Lapland the incidence rates nearly doubled in 2007 compared with the previous year (25 and 33 cases /100,000, respectively).

Because of the high incidence in Northern Finland, health counselling to injecting drug users should be increased to cut the infection rates.



SEXUALLY TRANSMITTED DISEASES

CHLAMYDIA (*CHLAMYDIA TRACHOMATIS*)

There were 13,973 notified cases of chlamydia in 2007 which is about the same as in 2006 (13,854). The incidence was 266/100,000. As earlier, the highest incidences were reported in the hospital districts of Åland (299/100,000) and Lapland (428/100,000).

Fifty-nine per cent of the patients were women. The majority of cases were diagnosed in 15–24-year-old women and 20–24-year-old men. As previously, in the age group of under 20-year-olds women constituted a remarkably larger group of patients (2,652) than men (772) (Figure 10).

GONORRHOEA (*NEISSERIA GONORRHOEAE*)

The National Infectious Diseases Register received 193 notifications of gonorrhoea. The number fell slightly compared with the previous year. Eighty-two per cent of the patients were men. The majority of patients were 20–55 years of age. The country of acquisition was specified in 76 per cent of infections. A decrease was seen in the number of infections acquired abroad. In 52 per cent of cases with a specified country of acquisition it was other than Finland. In 37 cases the infection was acquired in the Far East (31%). Six women had acquired the infection abroad.

Figure 10. Chlamydia by age groups in young adults, 1995–2007

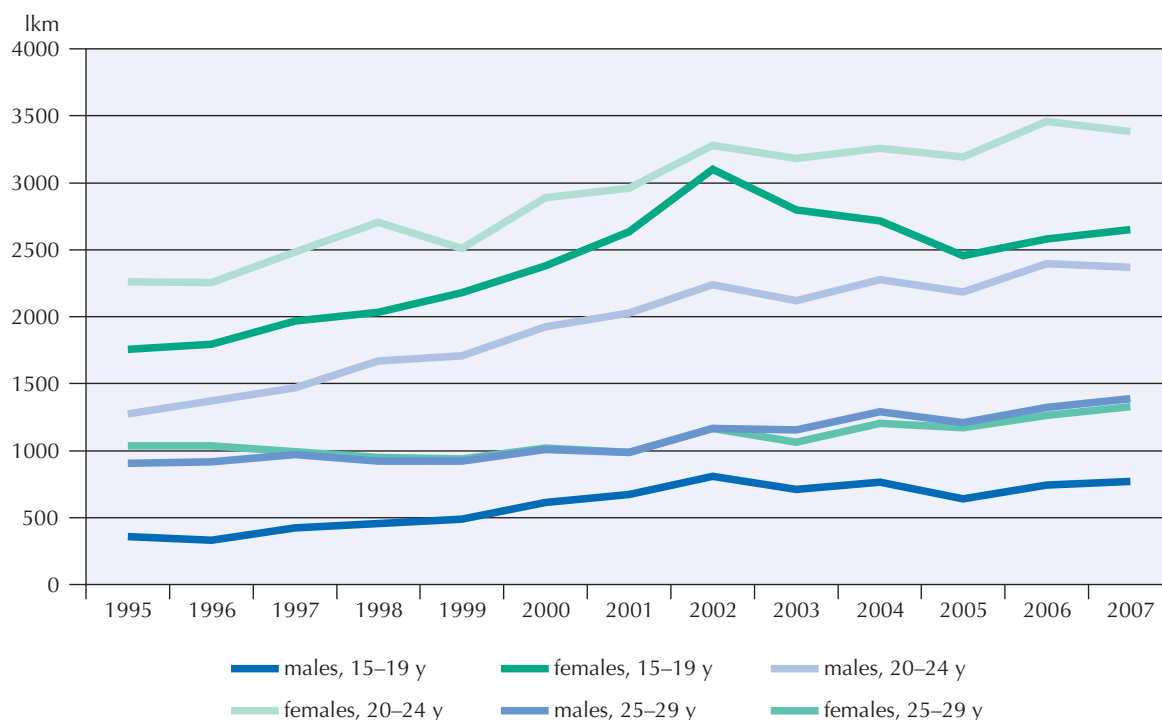


Table 4. Gonorrhea infections acquired domestically and abroad, 1995–2007

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Domestically acquired infections	185	83	94	100	108	129	113	100	89	133	132	112	75
Russia	70	50	42	49	42	48	34	28	9	7	23	12	5
Estonia	26	9	7	9	8	7	3	5	2	6	1		1
Thailand	9	9	7	16	19	18	17	31	27	38	30	42	41
Other	25	20	19	24	16	32	26	18	21	21	20	25	21
Place of acquisition unknown	63	55	49	71	62	50	54	53	41	47	34	45	50
Total	378	226	218	269	255	284	247	235	189	252	240	236	193

SYPHILIS (TREPONEMA PALLIDUM)

There were 184 notified syphilis cases in 2007. The figure was higher than in 2006 (130). Sixty-six per cent of the cases were diagnosed in men. Fifty-seven per cent of all cases were diagnosed in 25–50-year-olds. The incidences were highest in the hospital districts of Helsinki and Uusimaa (8.0/100,000), Etelä-Karjala (6.2/100,000), Kymenlaakso (4.9/100,000) and Kainuu (4.9/100,000). In the Helsinki and Uusimaa hospital district, the number of syphilis infections diagnosed in men nearly tripled from the previous year.

The country of acquisition was specified in 59 per cent of men's infections, and in 41 per cent

of these the infection was acquired abroad, most often in Russia (8). The country of acquisition was reported in 38 per cent of women's infections.

Nine women had acquired the infection in Finland and fifteen abroad, most often in Russia (Table 5).

HIV INFECTION

In 2007, nearly as many HIV cases were diagnosed as in the previous year when the number of cases increased by about forty per cent. There were 191 new diagnosed cases, 130 of them in Finns. The increase is due to the rise in sexually transmitted HIV infections that has continued throughout the 2000s. Meanwhile, the number of infections trans-

Table 5. Syphilis infections acquired domestically and abroad, 1995–2007

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Domestically acquired infections	48	53	50	46	21	54	31	24	30	22	25	20	51
Russia	49	57	48	33	43	80	49	21	18	16	22	17	15
Estonia	5	11	5	5	3	3	2	1	6	1	6	3	4
Somalia		1	2	5	2		1	2	2		3	3	2
Thailand	1		1	4		1	1		1	2	1	1	2
Other	9	12	14	13	14	17	11	12	14	12	16	17	21
Place of acquisition unknown	56	85	52	81	57	49	64	68	62	56	71	70	89
Total	168	219	172	187	140	204	159	128	133	109	144	131	184

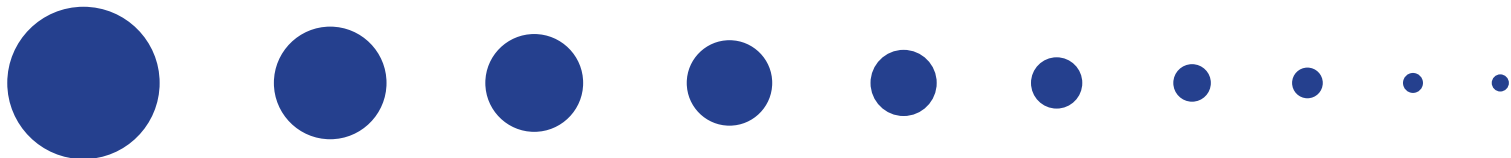
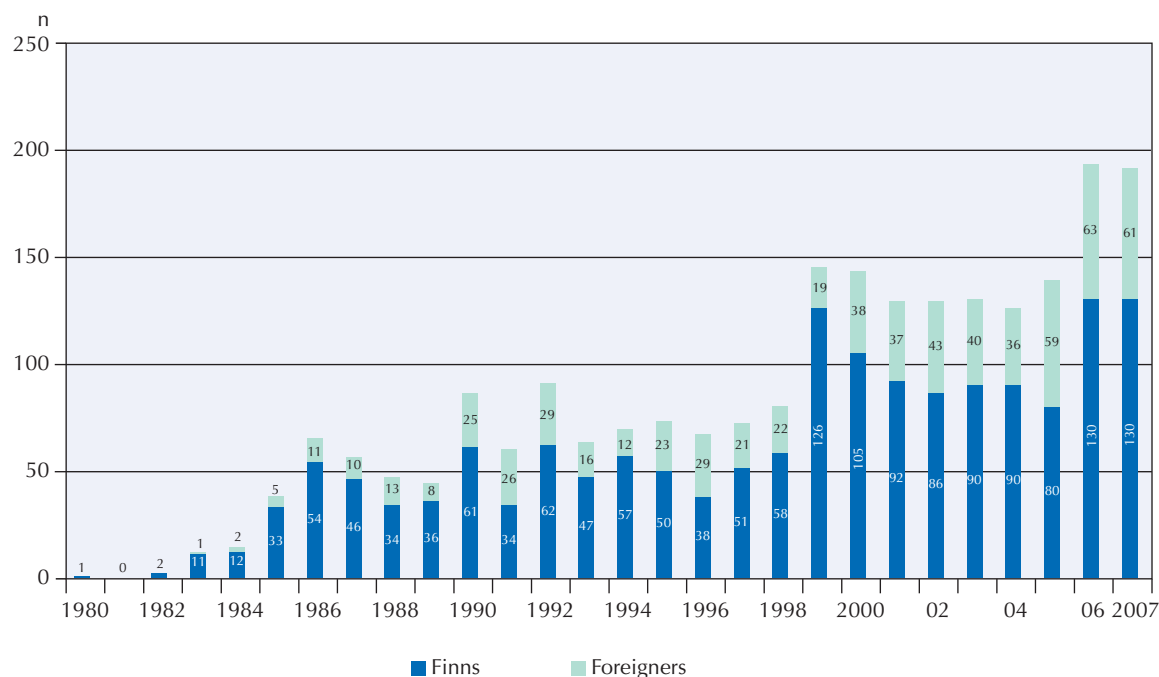


Figure 11. Hiv cases detected among immigrants and Finns, 1980–2007



mitted via injecting drugs has remained low. Ten cases in this category were diagnosed in 2007, only four of them in Finns.

Among Finns, sexually transmitted HIV infections have increased among men having sex with men as well as among heterosexuals. In both transmission categories, the number of cases has more than doubled since the beginning of the 2000s. This may be a sign of not realising the importance of safe sex or not understanding that everyone is at risk. The majority of sexually transmitted HIV infections in Finns are today acquired in Finland. Thus, the risk of contracting a sexually transmitted HIV infection in Finland has not decreased, quite the contrary.

Travel-related risks are still considerable: of the 130 infections contracted by Finns, 40 were probably acquired abroad. The majority of patients who acquired their infection abroad were men. About fifty per cent of them were heterosex-

ual and fifty per cent were men having sex with men. As regards heterosexual men, the nearby regions now constitute a more significant source of infections than Southeast Asia, while men having sex with men contract travel-related infections most often in Western Europe.

Four Finns had contracted HIV infection through injecting drug use. In two of these patients, the subtype of the viral strain suggests an infection acquired in Finland, while Estonia is the probable country of acquisition in the other two cases. Risks have increased in this group in Russia and Estonia but also in Stockholm, where a clear rise in the number of infections was seen in 2007, with an outbreak among injecting drug users. Based on preliminary information, the outbreak in Stockholm is caused by the same CRF01_AEfn strain detected in the earlier epidemic among injecting drug users in Finland. Sweden provides syringe exchange services only in a few cities in Southern Sweden.

ANTIMICROBIAL RESISTANCE

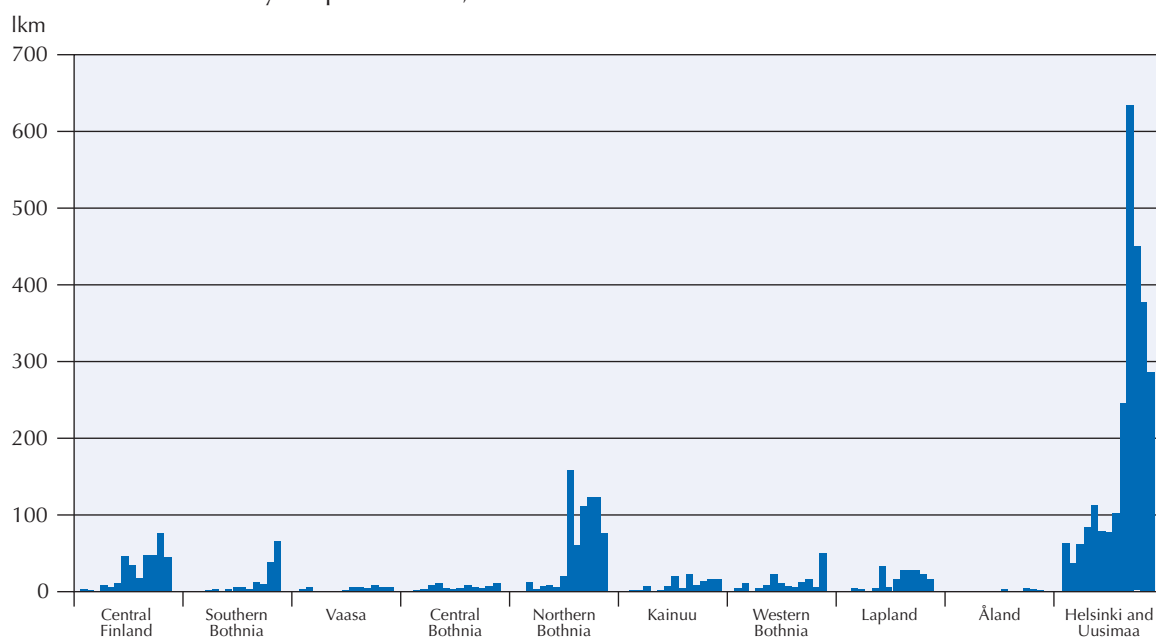
MRSA

In 2007, the situation with methicillin-resistant *Staphylococcus aureus* (MRSA) remained stable. Almost 1,300 cases of MRSA were notified to the National Infectious Diseases Register (1,317 in 2006). There were 32 MRSA findings from blood (36 cases in 2006) and no findings in cerebrospinal fluid. Fifteen MRSA findings from blood occurred in the Pirkanmaa hospital district (3.2/100,000) and seven in the Helsinki and Uusimaa hospital district (0.5/100,000). The other hospital districts notified one or two cases each, totalling seven. As earlier, the highest figures were seen the hospital districts of Helsinki and Uusimaa and Pirkanmaa. However, incidences per 100,000 population were highest in the hospital districts of Western Bothnia, Pirkan-

maa and Northern Karelia. As earlier, the majority of the patients were over 75 years of age. Children constituted less than 5 % of all cases MRSA, and the number of children's infections did not increase from the previous year.

The National Public Health Institute's Laboratory of Hospital Bacteriology confirms and types all MRSA strains in Finland. In 2007, the laboratory tested a total of 1,366 strains, which is slightly less than in 2006. Approximately 30 per cent of the confirmed MRSA infections were still caused by one multiply resistant epidemic strain (FIN-16) that has been causing problems for years. Other epidemic strains observed in previous years (FIN-4, FIN-7 and FIN-10 clones) were also common in many hospital districts. The number of infec-

Figure 12a. MRSA cases by hospital district, 1995–2007



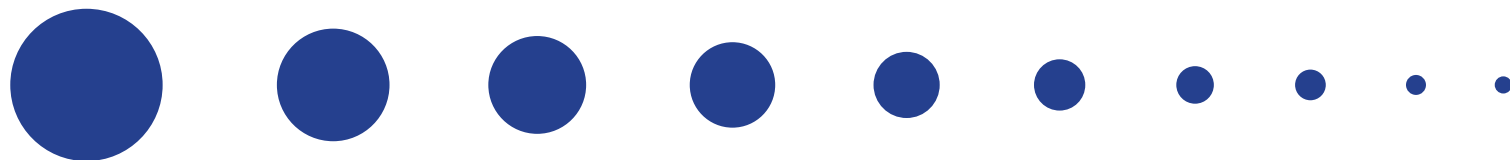


Figure 12b. MRSA cases by hospital district, 1995–2007

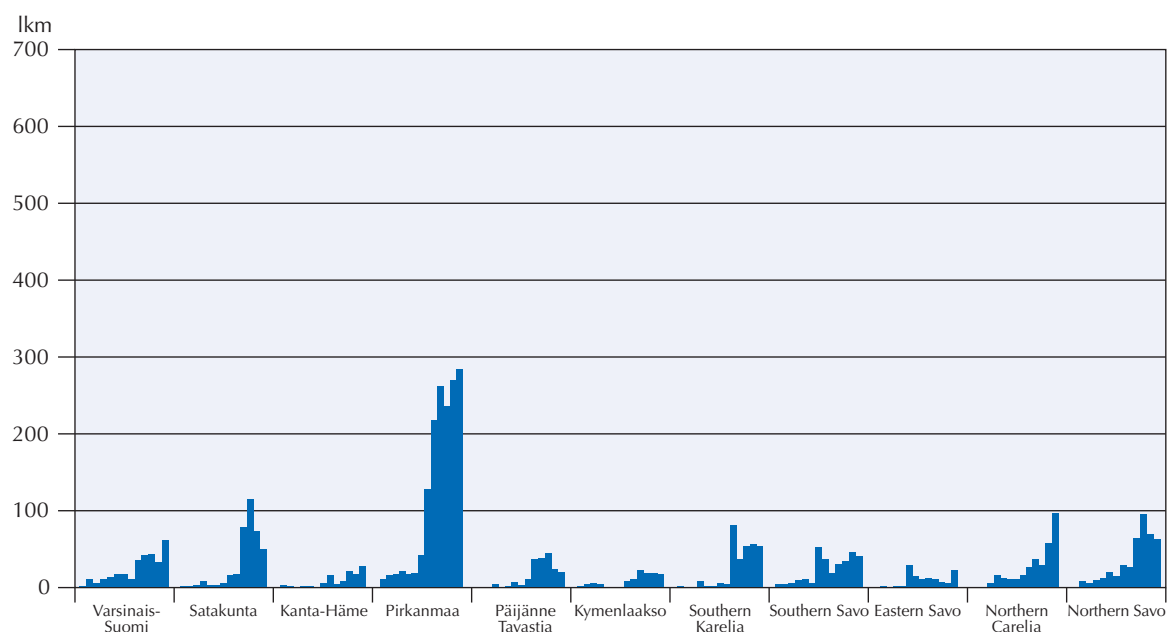


Table 7. MRSA-findings and their proportion of Staphylococcus aureus blood culture findings in 1995–2007

Year	All MRSA-findings	S. aureus –findings from blood	MRSA-findings in blood and their proportion of all S. aureus findings from blood (%)
1995	89	627	2 (0,3)
1996	108	667	0 (0)
1997	120	747	4 (0,5)
1998	189	717	5 (0,7)
1999	211	812	8 (1,0)
2000	261	849	4 (0,5)
2001	340	887	4 (0,5)
2002	599	988	10 (0,9)
2003	851	978	7 (0,7)
2004	1460	1057	32 (2,9)
2005	1368	1013	27 (2,7)
2006	1317	1239	36 (2,9)
2007	1285	1178	32 (2,7)
Total	8198	11759	171 (1,5)

tions caused by the second most common strain in 2005 (FIN-21) fell clearly for the second year in a row. While the FIN-21 strain represented 20 per cent of the cases in 2005 and about 10 per cent of the cases in 2006, its proportion fell to 4 per cent of all strains in 2007. Among the fifteen most common MRSA strains three were Panton-Valentine leukocidin (PVL) producing MRSA strains (FIN-25, FIN-11 and FIN-5). Five new epidemic strains were detected in 2007. Two of these (FIN-37 and FIN-39) were among the fifteen most common MRSA strains. FIN-16 caused almost half of all the MRSA findings in blood (13 cases). The rest of the MRSA findings in blood represented eight different strains (1–4 cases per strain).

VRE

In 2007, the number of vancomycin-resistant enterococcus (VRE) findings notified to the National Infectious Diseases Register doubled from the previous year. The majority of cases occurred in the

Northern Bothnia hospital district. The frequency of findings was highest early in the year, and most of the patients were 75 years of age or older. In the other hospital districts (n=6) the number of findings varied from one to seven. There were three VRE findings in blood and none in cerebrospinal fluid.

In 2007, the National Public Health Institute's Laboratory of Hospital Bacteriology confirmed a total of 60 new VRE findings in 57 persons by bacterial typing. Nearly all the findings represented the *E. faecium* species and the vanB type. The majority of the findings (n=44) represented the VRE IV strain detected in the Pohjois-Pohjanmaa district in previous years, and the rest (n=16) were unique findings or sporadic, previously identified VRE epidemic strain types.

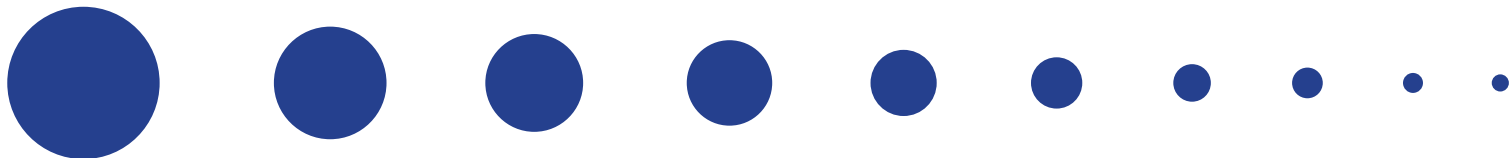
INVASIVE PNEUMOCOCCAL DISEASE (*STREPTOCOCCUS PNEUMONIAE*)

The number of notified cases of invasive pneumococcal disease totalled 788 (15/100,000) in

Table 8. Antimicrobial resistance of *Streptococcus pneumoniae* findings in blood and CSF, 1998–2007

Year	Cases notified to the National Infectious Diseases Register	Strains examined	Erythromycin (%)	Penicillin (I+R) (%)	Multidrug resistance (%)
1998	561	84	3,6	0	0
1999	568	471	5,9	7,2	0
2000	601	439	8,0	3,7	1,4
2001	658	360	18,8	7,5	5,0
2002	599	594	16,3	8,0	3,7
2003	721	739	21,9	12,7	5,7
2004	748	748	20,5	9,6	3,7
2005	735	731	20,5	9,6	4,4
2006	741	760	27,9	16,4	5,4
2007	788	794	23,2	14,4	3,5

I = reduced susceptibility; R = resistant; Multidrug resistance – strains simultaneously resistant to penicillin, erythromycin and tetracycline



2007. The incidence rose slightly from last year (14/100,000).

In 2007, the National Public Health Institute's Antimicrobial Research Laboratory analysed the antimicrobial susceptibility of 794 pneumococcal strains isolated from invasive infections. Compared with the year 2006, the proportion of strains with decreased susceptibility to penicillin (MIC \geq 0.125 μ g/ml) fell by two percentage points (14%). The

proportion of resistant strains (MIC \geq 2 μ g/ml) was 1.5 per cent, and 13 per cent of the strains had decreased susceptibility (I, intermediate). The proportion of macrolide resistant strains decreased as well; 23 per cent of invasive pneumococcal strains were resistant to erythromycin. The proportion of multiply resistant (PEN-ERY-TET) strains in 2007 was 3.5 per cent. Fluoroquinolone resistant and ceftriaxone resistant strains were not detected in 2007.

MYCOBACTERIAL INFECTIONS

TUBERCULOSIS – *MYCOBACTERIUM TUBERCULOSIS*

The registration of tuberculosis cases in Finland changed in 2007 due to the new case definitions by EU. As a consequence, the number of tuberculosis cases increased as compared with the preceding year. If the case definitions of the previous years had been applied, the decline in the number cases would have continued in 2007.

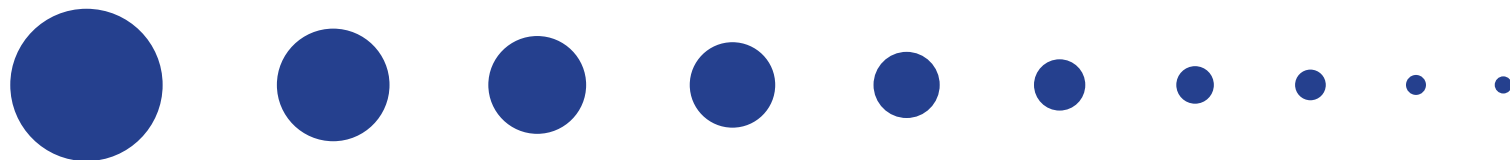
Between 1995 – 2006 the following cases were registered in the statistics: all culture –confirmed cases and, in addition, those cases notified by physicians only, for which the sputum smear for acid fast bacilli was been positive or histological evidence of tuberculosis was notified.

From 2007 also those cases are registered, in which the physician clinically suspected tuberculosis and decided to give a full tuberculosis treatment, even if tuberculosis had not been confirmed by microbiological tests or histology. The added criterion for registration does not influence the number of those cases for which the registration is based on laboratory tests or histology.

With the new criteria for registration, there were 324 tuberculosis cases in 2007, 11 % more than in 2006 (291). Tuberculosis incidence was 6,1/100 000. If the criteria of the preceding years had been applied, the number of cases would have been 272 (7 % less than in 2006), continuing the

Table 6. Incidence of tuberculosis in Finland, 1995–2007

Year	Pulmonary tuberculosis				Other tuberculosis		All cases			
	Cases	Cases / 100 000	Cases with positive sputum smear	Cases with positive sputum smear / 100 000	Cases	Cases / 100 000	Cases	Cases / 100 000	Culture-confirmed cases	Proportion of culture-confirmed cases (%)
1995	435	8,5	243	4,8	227	4,5	662	13	472	71,3
1996	432	8,4	241	4,7	213	4,2	645	12,6	510	79,1
1997	363	7,1	188	3,7	212	4,1	575	11,2	435	75,7
1998	397	7,7	201	3,9	231	4,5	628	12,2	491	78,2
1999	382	7,4	180	3,5	183	3,5	565	11	487	86,2
2000	370	7,2	227	4,4	167	3,2	537	10,4	451	84
2001	315	6,1	158	3	178	3,4	493	9,5	411	83,4
2002	296	5,7	138	2,7	176	3,4	472	9,1	391	82,8
2003	291	5,6	148	2,8	121	2,3	412	7,9	347	84,2
2004	230	4,4	127	2,4	101	1,9	331	6,3	286	86,4
2005	263	5	135	2,6	98	1,9	361	6,9	316	87,5
2006	209	4	98	1,9	82	1,6	291	5,5	265	91,1
2007	225	4,3	91	1,7	99	1,9	324	6,1	245	75,6



long-lasting decline in the number of cases. In 2007, there were 245 culture-confirmed cases, 8 % less than in 2006 (265). Based on physician notifications, 11 (3 %) cases had earlier had tuberculosis since 1950, when antituberculosis chemotherapy was introduced.

Based on the new criteria for registration, there were 225 pulmonary tuberculosis cases (4,3/100 000) and 99 cases of other forms of tuberculosis. The physicians notified a positive sputum smear for acid fast bacilli in 91 pulmonary tuberculosis cases (40 %).

Out of all tuberculosis cases, 4 (1 %) were notified in the age group less than 15 years old, 44 (14 %) in the age group 15–29 years, 38 (12 %) in the age group 30–44 years, 70 (22 %) in the age group 45–59 years, 70 (22 %) in the age group 60–74 years and 98 (29 %) in those aged 75 years or more. In 2007, the median age of all cases was 61 years. The median age of cases born in Finland was 69 years.

In 2007, 73 (23 %) cases were notified in persons born abroad or with a nationality other than Finland. Among them, three (4 %) were less than 15 years of age and 58 (79 %) aged 15–44. Fortysix (63 %) of the cases were pulmonary and 27 (37 %) other forms of tuberculosis.

The susceptibility status of *Mycobacterium tuberculosis* isolates continues to be good. In 2007, one (0,4 %) multiresistant (MDR, resistant at least to isoniazide and rifampin) strain of *M. tuberculosis* was isolated in a person with Russian origin.

Among the tuberculosis cases in 2007, 10 (3 %) also had HIV infection. In four cases, both infections had been notified for the first time in 2007.

Findings from epidemiological typing

In five cases, genotyping was carried out to investigate whether the infection was caused by a strain previously isolated from the same patient, ie relapse, or from infection originating from another source. In all five cases, identical genotypes proved the recent disease to be due to a relapse.

In six instances, involving a total of 18 bacterial strains, possible associations between cases were investigated. In four instances, an association could be excluded. In two instances, both from the capital region, the isolates had identical genotypes proving a probable transmission chain.

In five cases, laboratory contamination was suspected: in three cases this turned out to be likely, and in two cases contamination was excluded.

Mycobacterium bovis BCG

In 2007, one culture finding of *Mycobacterium bovis* BCG was notified in the age group less than 15 years-old.

Between 1995–2002, one to five *M. bovis* BCG culture findings were annually notified in children less than 15 years old. The number increased to 30 in 2003 and remained on a level higher than in earlier years (13 in 2004, 23 in 2005, and 13 in 2006).

M. bovis BCG is an attenuated bacterial strain developed from *M. bovis*, which belongs to the *M. tuberculosis* -complex. It is used as the BCG vaccine in infants to prevent serious forms of tuberculosis in small children. The attenuated strain does not cause tuberculosis. In Finland, BCG vaccinations were targeted since September 1, 2006, to children, who have an increased risk of contracting tuberculosis.



OTHER INFECTIONS

HAEMOPHILUS (*HAEMOPHILUS INFLUENZAE*)

In 2007, there were 54 notified *Haemophilus influenzae* infections diagnosed in blood or cerebrospinal fluid. *Haemophilus influenzae* type b caused an infection in four adults and two children. One of the children was a five-year-old unvaccinated child of foreign birth visiting Finland, and the other was a Finnish infant under three months of age. Since 1986, children born in 1985 or later have received Hib vaccine at the child welfare clinic. Since the beginning of 2005, according to the revised vaccination programme, Hib vaccination is administered as a component of the combination vaccine at the age of three, five and twelve months. The efficiency of the vaccination is monitored, and vaccination data are investigated for all children diagnosed with Hib.

MENINGOCOCCUS (*NEISSERIA MENINGITIDIS*)

There were 43 meningococcal infections diagnosed in blood or cerebrospinal fluid, which is similar to previous years. The serogroup distribution was the same as before. The majority of infections were caused by group B meningococcus. There were five group Y strains and eight group C strains. In one case the serogroup was unidentifiable. Six cases were 0–4 years old and fourteen were 15–19 years of age.

In March 2007, three 18–20-year-old men in Kangasala contracted a group B meningococcal infection of the same subtype. In September in Imatra, one 3-year-old child in day care and one 14-year-old schoolchild contracted meningococcal infection. Based on the typing data, the infection in the 3-year-old was caused by a group C menin-

gococcus, and a group B meningococcus caused the infection in the 14-year-old. In September–October, three adults aged 42, 49 and 52 years and one under 12-month-old child contracted a meningococcal infection in Helsinki. The 49-year-old and the under 12-month-old patient had infections caused by B group meningococci of different subtypes, the infection in the 52-year-old was caused by a group C meningococcus, and the infection in the 42-year-old was caused by an unidentified meningococcus (Table 9).

MMR DISEASES (MORBILLI, PAROTITIS EPIDEMICA, RUBELLA)

Not a single case of measles or rubella was notified in 2007. Six cases of mumps were notified. Two patients were under 20 years of age and four were adults. In one unvaccinated 17-year-old patient the source of infection could not be identified. The other five patients had contracted the disease abroad.

Measles, mumps and rubella (the MMR diseases) are typical children's diseases caused by viruses. Their prevention in Finland was initiated by launching the MMR vaccination programme in 1982. As a result of the programme, endemic cases have not been diagnosed in Finland since the mid-1990s. In the past 10 years, nearly all diagnosed MMR cases were acquired in a country where MMR diseases still occur.

PUUMALA VIRUS (EPIDEMIC NEPHROPATHY)

There were 1,726 notified cases of Puumala virus in 2007, which is about the same as in 2006. Epi-

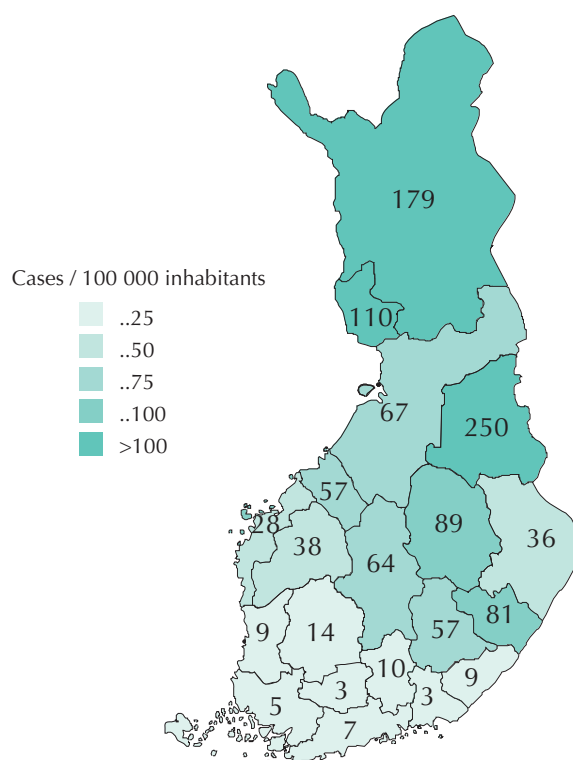
Table 9. Meningococcal infections by serogroup, 1995–2007

Year	Group A	Group B	Group C	Group Y	Group W135	Unknown	Total
1995	-	50	22	-	-	6	78
1996	-	59	15	3	-	2	79
1997	-	36	5	3	-	2	46
1998	-	44	7	2	-	1	54
1999	-	35	9	8	1	5	58
2000	-	30	11	2	3	2	48
2001	-	34	9	4	1	3	51
2002	-	36	6	4	1	2	49
2003	-	28	5	6	-	2	41
2004	-	29	5	4	2	4	44
2005	-	33	1	3	-	3	40
2006	-	38	5	1	-	1	45
2007	-	29	8	5	-	1	43

demic nephropathy has its highest incidence in November–December. The number of cases varies, depending on the virus reservoir and the size of the bank vole population. The variation follows a three-year cycle so that two abundant winters (such as 2004 and 2005) are followed by a quieter November–December. The latest quiet winter was 2006, with about 400 Puumala virus cases notified in November–December. In 2007, the end of the year was less quiet again, with 597 Puumala virus cases notified in November–December. The incidence was lowest in March–May.

In 2007, the incidence rates were highest in the Kainuu hospital district (250/100,000) and Lapland hospital district (179/100,000). In typical high incidence regions the figures were slightly lower, 79/100,000 in Eastern Savo and 57/100,000 in Southern Savo. More than half of all the cases were diagnosed in 35–59-year-olds. Sixty per cent of all epidemic nephropathy patients were men (Figure 13).

Figure 13. Incidence of Puumala virus cases by hospital district 2007





TICK-BORNE ENCEPHALITIS (TBE)

Twenty cases of TBE were notified to the National Infectious Diseases Register in 2007. The figure is slightly higher than in 2006. The number of TBE cases in Finland has ranged from 12 to 41 per year. The cases notified in 2007 were diagnosed between May and October, with the highest frequency in June–August. Before the vaccination campaign initiated on Åland in 2006, about two thirds of the cases were diagnosed in persons living on Åland. Five persons contracted TBE on Åland in 2007, which makes up 25 per cent of all cases. One TBE patient living on Åland had received appropriate vaccinations.

The patient's place of residence is recorded in the National Infectious Diseases Register, which may be different from the place of contracting TBE. In order to identify the place of acquisition, an infectious disease specialist from the National Public Health Institute interviewed patients with TBE diagnosed in 2007 and/or studied their patient records. One patient contracted the infection in Närpiö, far from the well-known endemic TBE regions Kokkola and Turku archipelago. Three patients contracted TBE in the Kokkola region and two in the Lappeenranta region. Nine patients had contracted the disease outside of their place of residence; six on Åland and three in the Turku archipelago.

TULAREMIA (*FRANCISELLA TULARENSIS*)

About 400 cases of tularemia (8/100,000) were notified to the National Infectious Diseases Register in 2007. The high incidence is associated with a tularemia outbreak; normally about 100 cases are reported each year (1–2/100,000). Previous significant tularemia outbreaks occurred in 1995, 1996, 2000, 2003 and 2006.

The incidence was highest (81/100,000) in the Northern Bothnia hospital district, where tularemia is endemic. Typical top incidence districts had considerably lower rates, 8/100,000 in Central Finland and 3/100,000 in Southern Bothnia. In 2007, about half of the patients were men. Infections were diagnosed in all age groups, most frequently in 35–65-year-olds. The majority of cases were diagnosed between August and September.

Tularemia is mainly transmitted by mosquitoes. When the infection is transmitted from an insect to a human, the site of the bite becomes red, swollen and sore, and it develops into an ulcer. The infection spreads into local lymph glands (ulcero-glandular form). The disease may also be transmitted through airways or through a direct contact with an ill animal.

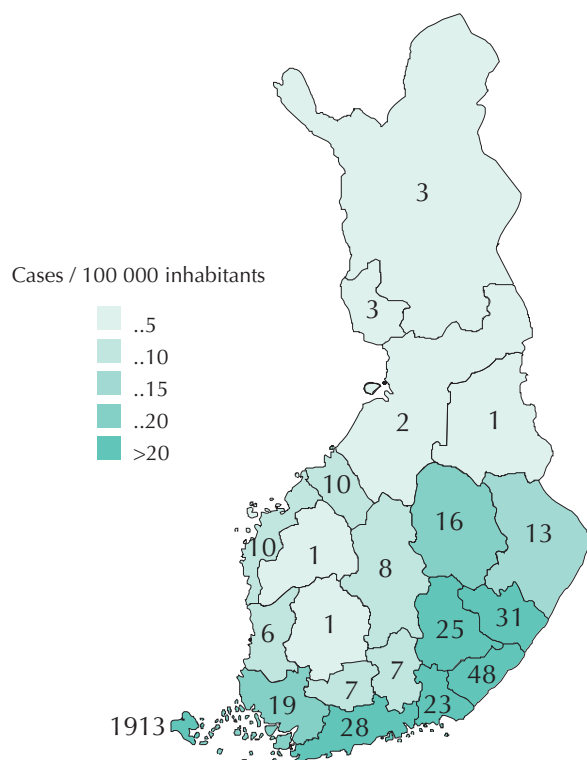
POGOSTA DISEASE (*SINDBIS VIRUS*)

Pogosta disease is caused by the Sindbis virus. Since 2004 the number of cases has remained exceptionally low. There were 30 notified cases in 2007 (0.6/100,000). The majority of cases were reported in August–September in Eastern and Western Finland and the province of Oulu. Extensive Pogosta disease outbreaks occur in Finland with seven year intervals, with the latest outbreak in 2002.

BORRELIA (*LYME DISEASE*)

Borrelia cases increased since 2004. There were 1,330 notified cases in 2007 (25/100,000). The incidence was once again highest on Åland with more than 500 cases, making up nearly 40 per cent of all borrelia cases in Finland (1,938/100,000). As earlier, the occurrence was highest in autumn from August to November. The

Figure 14. Incidence of borrelia cases by hospital district 2007



majority of cases (72%) were diagnosed in over 45-year-olds (Figure 14).

MALARIA

In 2007, malaria was diagnosed in 21 patients in Finland, additionally there was one diagnosed vivax malaria relapse. There were 14 *Plasmodium falciparum* cases, three *P. vivax* cases, one *P. ovale* case, one *P. malariae* case and one case with *P. falciparum* + *P. vivax* mixed infection. Furthermore, one case with *P. knowlesii* infection was diagnosed.

Fifteen infections (71%) were acquired in Africa. Nine patients were Finns and 12 were foreigners. Thirteen patients were permanent resi-

dents of Finland. Seven patients were native Finns who had taken a short trip of less than six months to a malaria region, and one was a Finn residing in a malaria region. Three patients were immigrants from malaria regions who had visited their former home country. Nine were refugees who had taken ill immediately after arriving in Finland, and one was a visitor to Finland.

The number of malaria cases, the countries of acquisition and the risk groups have remained approximately the same in recent years. Of the nine refugees diagnosed with malaria, five were members of a Liberian family arriving from Sierra Leone and three were Myanmar refugees arriving from Thailand. The majority of the 21 malaria patients had taken no malaria prophylaxis at all or had taken it irregularly. As regards the native

Table 10. Malaria cases in Finland in 2007 by country of acquisition

Continent	Country	Cases
Asia	Thailand	3
	Malaysia	1
	Myanmar	0
	Total	4
Africa	Liberia	1
	Nigeria	3
	Gambia	3
	Sierra Leone	5
	Congo	1
	Uganda	1
	Burkina Faso	1
	Total	15
Oceania	Papua New Guinea	1
	Total	1
South America	Dominican Republic	1
	Total	1
	Total	21

Finnish patients, three of them had contracted malaria in Gambia. One infection was contracted in the Dominican Republic in a region where malaria does not normally occur. One Finnish tourist who had visited the jungle in Malaysia was diagnosed with a *P. knowlesii* infection. This is a plasmodium species that causes malaria in monkeys but has recently been reported to cause malaria in humans in Malaysia. The Finnish patient is the second tourist reported to have acquired a *P. knowlesii* infection.

BLOOD AND CSF FINDINGS IN CHILDREN

Blood culture findings in children

In 2007, the number of cases with blood culture in children under 15-years-old remained at the same level as in 2004–2006, with 669 notified cases. Half of the cases were diagnosed in under 1-year-olds.

In under 1-year-olds, *Staphylococcus epidermidis* and other coagulase negative staphylococci caused about 40% of the cases with blood culture

findings. These infections are typical in newborn babies in intensive care, and they usually occur later than three days after birth ('late-onset sepsis'). The second most common cause was *Streptococcus agalactiae* (Group B streptococcus, GBS). It is typically contracted from the mother's birth canal during labour and causes an infection in the newborn baby during the first days of life ('early-onset sepsis'). Other common causes of infection were *Escherichia coli*, *Staphylococcus aureus* and *Streptococcus pneumoniae*. Methicillin-resistant *S. aureus* (MRSA) strains were not found among the notified cases. The proportion of enterococci in blood findings in infants was clearly lower in 2007 (2%) than in the five preceding years (4–6%).

S. pneumoniae was the most common finding in 1–14-year-olds, covering more than a third of the notified cases in this age group. It was followed by coagulase negative *S. aureus* and *E. coli*. One of the notified *S. aureus* cases was caused by MRSA.

Table 11. Blood culture findings 1995–2007, infants (under 1 years of age)

Microbe/ microbial group	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
<i>Staphylococcus</i> , other than <i>aureus</i>	57	84	76	99	112	81	146	129	142	131
<i>Streptococcus agalactiae</i>	48	42	38	41	46	37	45	73	55	51
<i>Escherichia coli</i>	48	39	43	39	40	39	37	41	44	42
<i>Staphylococcus aureus</i>	33	29	17	17	24	21	32	32	37	25
<i>Streptococcus pneumoniae</i>	17	16	28	19	17	25	28	26	27	21
<i>Streptococcus viridans</i> -group	6	10	6	10	8	12	15	12	10	9
<i>Enterococcus faecalis</i>	11	7	4	6	11	11	9	15	22	8
<i>Enterobacter</i> species	7	10	6	6	6	6	5	3	13	8
<i>Klebsiella</i> species	8	10	9	8	7	8	9	9	8	6
<i>Bacillus</i>	1	-	1	2	-	1	2	2	1	4
Other bacteria	41	35	37	22	35	28	36	17	27	28
Bacteria, total	277	282	265	269	306	269	364	359	386	333
Fungi	3	16	12	11	18	4	3	5	4	4
Total number of cases	280	298	277	280	324	273	367	364	390	337

Table 12. Blood culture findings 1998–2007, children (1–14 years)

Microbe/microbial group	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
<i>Streptococcus pneumoniae</i>	60	61	72	76	92	94	88	101	99	114
<i>Staphylococcus</i> , other than <i>aureus</i>	34	52	63	44	54	46	34	54	48	51
<i>Staphylococcus aureus</i>	48	57	42	35	58	47	58	41	37	42
<i>Streptococcus viridans</i> -group	26	19	18	22	12	12	18	24	24	23
<i>Streptococcus pyogenes</i>	10	11	9	9	10	12	4	-	9	13
<i>Escherichia coli</i>	13	14	20	5	13	13	15	10	16	12
<i>Klebsiella</i> species	3	4	2	2	6	4	5	10	3	6
<i>Fusobacterium</i> species	2	5	4	1	3	-	1	2	3	5
<i>Salmonella</i> , other than <i>Typhi</i>	2	4	1	1	1	1	1	1	2	5
<i>Enterococcus faecium</i>	-	-	2	2	4	1	2	2	3	4
Other bacteria	53	61	61	48	55	59	44	72	49	53
Bacteria, total	251	288	294	245	308	289	270	317	293	328
Fungi	3	7	5	1	3	3	1	1	5	4
Total number of cases	254	295	299	246	311	292	271	318	298	332

Table 13. Cerebrospinal fluid culture findings 2002–2007, infants (under 1 year of age)

Microbe/microbial group	2002	2003	2004	2005	2006	2007
<i>Streptococcus agalactiae</i>	5	1	10	7	7	6
<i>Streptococcus pneumoniae</i>	3	6	8	3	1	4
<i>Staphylococcus</i> , other than <i>aureus</i>	8	4	5	4	3	2
<i>Neisseria meningitidis</i>	1	2	4	-	1	2
<i>Enterococcus faecalis</i>	-	1	1	-	2	1
Other bacteria	5	7	9	2	5	4
Bacteria, total	22	21	37	16	19	18
Fungi	-	-	-	-	-	-
Total number of cases	22	21	37	16	19	18

Table 14. Cerebrospinal fluid culture findings 2002–2007, children (1–14 years)

Microbe/microbial group	2002	2003	2004	2005	2006	2007
<i>Neisseria meningitidis</i>	7	4	4	5	7	5
<i>Streptococcus pneumoniae</i>	2	10	2	1	5	5
<i>Staphylococcus aureus</i>	1	2	2	-	-	2
<i>Staphylococcus</i> , other than <i>aureus</i>	10	3	6	4	-	1
<i>Streptococcus viridans</i> -group	-	1	1	-	2	-
Other bacteria	10	5	4	8	4	-
Bacteria, total	30	25	19	18	18	13
Fungi	-	-	1	-	-	-
Total number of cases	30	25	20	18	18	13

Coagulase negative staphylococci caused nearly a third of all cases diagnosed in children, the situation being similar since 2001. Intensive care and associated interventions, particularly in-dwelling foreign bodies, such as central venous catheters, often constitute the predisposing factor for infections caused by these bacteria. Compared with recent years, there were no significant changes in children's blood findings. Fungi constituted only one per cent of the findings.

Cerebrospinal fluid findings in children

The number of cases with bacterial and fungal findings from CSF in children has remained at a very stable level since 1995. About half of the cases are diagnosed in children under 12 months of age. In 2007 there were altogether 32 notified cases in under 15-year-olds.

The most common finding in children under 12 months of age was *S. agalactiae* (GBS) with six cases. Meningitides due to GBS are usually late-

onset infections in infants, often with an unidentified source of origin; the mother has been found to carry GBS in only about half of the cases. The next most common finding was *S. pneumoniae* with four notified cases. *S. epidermidis* and meningococcus were both notified twice. All the other cases were sporadic findings.

Meningococcus and pneumococcus were the most common findings in 1–14-year-olds, both with five notified cases. *S. aureus* was notified twice and *S. epidermidis* once. The total number of cases in this age group – and in under 15-year-olds overall – was slightly lower than in 2002–2006.

BLOOD AND CSF FINDINGS IN ADULTS

Blood culture findings in adults

The total number of cases with blood culture findings in adults has grown steadily in recent years. In 2007, there were nearly 10,000 cases. Gram-positive bacteria are still more common in the

Table 15. Blood culture findings 1998–2007, working-age population (15–64 years)

Microbe/microbial group	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
<i>Escherichia coli</i>	495	547	532	613	580	645	707	780	797	838
<i>Staphylococcus aureus</i>	340	389	394	437	457	445	486	457	564	544
<i>Staphylococcus</i> , other than <i>aureus</i>	319	347	402	406	444	400	421	399	401	407
<i>Streptococcus pneumoniae</i>	283	298	310	343	330	406	387	376	346	353
<i>Klebsiella</i> species	106	114	115	114	134	121	159	184	145	159
<i>Streptococcus pyogenes</i>	63	81	84	60	93	78	93	76	105	133
<i>Streptococcus viridans</i> -group	91	115	117	116	104	121	141	141	130	118
<i>Streptococcus</i> , other beta-haemolytic	59	64	59	66	78	79	102	96	127	117
<i>Enterococcus faecalis</i>	57	76	67	95	98	84	80	100	83	101
<i>Streptococcus agalactiae</i>	55	60	63	76	78	68	64	99	76	83
Other bacteria	690	652	686	748	662	681	694	795	802	829
Bacteria, total	2558	2743	2829	3074	3058	3128	3334	3503	3576	3682
Fungi	62	58	56	71	54	80	71	66	80	84
Total number of cases	2620	2801	2885	3145	3112	3208	3405	3569	3656	3766



Table 16. Blood culture findings 1998–2007, aged population (65 years and more)

Microbe/microbial group	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
<i>Escherichia coli</i>	967	1012	1033	1178	1213	1314	1466	1623	1706	1761
<i>Staphylococcus aureus</i>	296	337	397	398	449	466	483	483	601	567
<i>Staphylococcus</i> , other than <i>aureus</i>	216	281	349	361	363	343	370	402	395	415
<i>Klebsiella</i> species	177	167	201	241	230	252	342	339	326	340
<i>Streptococcus pneumoniae</i>	185	178	189	216	200	241	239	229	270	293
<i>Enterococcus faecalis</i>	116	119	143	142	149	146	192	183	202	217
<i>Pseudomonas aeruginosa</i>	94	116	119	132	148	148	138	151	154	189
<i>Streptococcus</i> , other beta-haemolytic	73	97	87	105	100	123	135	140	174	171
<i>Bacteroides fragilis</i> -group	81	99	96	104	96	117	120	135	119	135
<i>Enterococcus faecium</i>	41	43	60	61	48	75	96	73	108	129
Other bacteria	606	596	677	758	721	774	863	924	965	986
Bacteria, total	2852	3045	3351	3696	3717	3999	4444	4682	5020	5203
Fungi	43	51	68	71	71	113	77	68	76	83
Total number of cases	2895	3096	3419	3767	3788	4112	4521	4750	5096	5286

Table 17. Cerebrospinal fluid culture findings 2002–2007, working-age population (15–64 years)

Microbe/microbial group	2002	2003	2004	2005	2006	2007
<i>Staphylococcus</i> , other than <i>aureus</i>	42	28	40	48	44	24
<i>Neisseria meningitidis</i>	19	15	11	15	20	16
<i>Staphylococcus aureus</i>	6	10	17	10	9	16
<i>Streptococcus pneumoniae</i>	18	26	21	15	17	13
<i>Pseudomonas</i> , other than <i>aeruginosa</i>	6	6	11	5	5	5
Other bacteria	44	26	27	47	51	48
Bacteria, total	135	111	127	140	146	122
Fungi	2	1	6	2	3	6
Total number of cases	137	112	133	142	149	128

working-age population (15–64-year-olds) and gram-negative bacteria among those aged 65 or more. Anaerobic bacteria constituted nearly five per cent and fungi about two per cent of all blood culture positive findings.

In the working-age population, the most common bacterial finding was *Escherichia coli*, constituting about twenty per cent of all cases. It was followed by *Staphylococcus aureus*, coagulase negative staphylococci and *Streptococcus pneumoniae*.

E. coli was also the most common blood culture finding among patients aged 65 years or more, representing a third of all findings. The next most common bacterial findings were *S. aureus*, coagulase negative staphylococci, *Klebsiella* species and *S. pneumoniae*.

The number of cases with group A streptococci (*Streptococcus pyogenes*) increased among the working-age population. The prevailing emm types have partly been replaced with new, less

known types, but the emm 1 type (previously T1M1) that caused severe illnesses in the past has also increased. Since 1995, the number of blood culture confirmed pneumococcal infections has been on the rise among the elderly, and in 2007 the number of findings reached a new record (293) (Table 19).

Among the working-age population, the number of *Candida albicans* findings has tripled and among over 65-year-olds it has doubled from 1995 to 2007.

Cerebrospinal fluid findings in adults

The number of bacterial and fungal findings in adults doubled from 1995 to 2004. After 2004, the

number of findings has remained relatively stable. In 2007, there was even a slight decrease in the number of CSF findings in the working-age population and the elderly. The most common bacterial finding in working-age patients is still coagulase negative staphylococcus. As regards actual pathogens, meningococcus and

S. aureus were equally common, followed by pneumococcus.

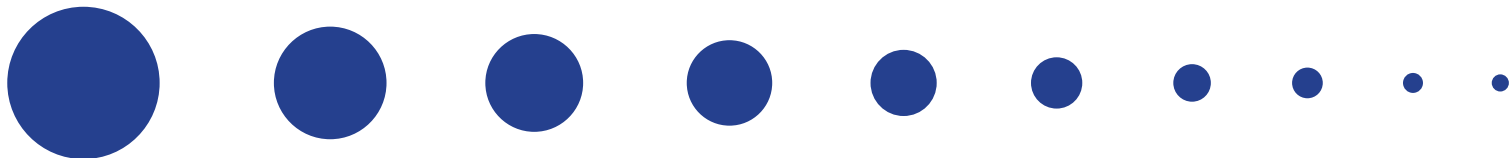
Coagulase negative staphylococcus was also the most common culture finding in patients aged 65 years or more. It was followed by pneumococcus, *Enterococcus faecalis*, *S. aureus* and *Listeria monocytogenes*.

Table 18. Cerebrospinal fluid culture findings 2002–2007, aged population (65 years and more)

Microbe/microbial group	2002	2003	2004	2005	2006	2007
<i>Staphylococcus</i> , other than <i>aureus</i>	12	9	11	15	12	14
<i>Streptococcus pneumoniae</i>	4	5	4	8	10	4
<i>Enterococcus faecalis</i>	2	3	-	2	2	3
<i>Staphylococcus aureus</i>	2	7	7	5	3	2
<i>Listeria monocytogenes</i>	2	4	2	4	3	2
Other bacteria	20	17	13	12	12	7
Bacteria, total	42	45	37	46	42	32
Fungi	2	-	1	1	2	-
Total number of cases	44	45	38	47	44	32

Table 19. *S. pyogenes* blood findings according to emm-type, 2004–2007

Cases notified to the National Infectious Disease Register	Strains examined	emm1	emm28	emm84	other	NT
2004	130	6 (4,6%)	46 (35,4%)	0 (0,0)	72 (55,4%)	6 (4,6%)
2005	113	9 (8,0%)	22 (19,5%)	1 (0,9%)	79 (69,9%)	2 (1,8%)
2006	163	25 (15,3%)	33 (20,2%)	24 (14,7%)	70 (42,9%)	11 (6,7%)
2007	205	58 (28,3%)	26 (12,7%)	32 (15,6%)	84 (41,0%)	5 (2,4%)



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